AN EMPIRICAL INVESTIGATION OF THE EFFECT OF INTELLECTUAL PROPERTY RIGHTS ON FOREIGN DIRECT INVESTMENT FLOWS AND SPILLOVERS

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ABSTRACT

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An empirical investigation of the effect of Intellectual Property Rights systems on Foreign Direct Investment Flows and Spillovers

Keywords: Intellectual Property Rights, Foreign Direct Investment, Spillovers, Meta-analysis

The major themes of this thesis are the impact of Intellectual Property (IP) systems on foreign direct investment spillovers and bilateral FDI flows.

This thesis consists of three empirical studies. The first study integrates in the existing theoretical frameworks the distinct effect of the public IP enforcement element of IP systems on FDI horizontal spillovers. By employing a meta-analysis approach and the ordered probit model estimation technique, it finds that the strength of public IP enforcement in a host country has a positive effect on FDI horizontal spillovers but it dampens the positive effect of IP law protection on FDI horizontal spillovers when it becomes too strong.

The second empirical study examines the impact of IP systems on FDI vertical spillovers. This study employs a similar conceptual and empirical approach and finds that the strength of public IP enforcement has a positive effect on FDI vertical spilloversbut a negative moderating effect on the relationship between the strength of IP law protection and FDI vertical spillovers.

In the third empirical study, a gravity model is applied to test the effect of IP systems on bilateral FDI flows in OECD countries. Using the Poisson pseudo-maximum-likelihood, it finds both the strength of IP law protection and the strength of public IP enforcement to have a positive effect on bilateral FDI flows.

The broad implication of these findings is that countries should strengthen both their IP law protection and enforcement but apply appropriate measures to mitigate the negative effect resulted from excessive IP protection.

To you...

‘No matter what anybody tells you, words and ideas can change the world’

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LIST OF ABBREVIATIONS

EU: European Union

FDI: Foreign Direct Investment

FT: Financial Times

GATT: General Agreement on Tariffs and Trade

GMM: Generalized Method of Moments

IB: International Business

ICC: International Chamber of Commerce

IMD: Institute of Management and Development

IP: Intellectual Property

IPRs: Intellectual Property Rights

IPSS: International Patent System Strength

LOF: Liability of Foreignness

MNEs: Multinational Enterprises

OECD: Organization for Economic Co-Operation and Development

OLS: Ordinary Least Squares

PPML: Poison Pseudo-Maximum Likelihood

R&D: Research and Development

TCT: Transaction Cost Theory

TRIPs: Trade Related Aspects of Intellectual Property Rights

UNCTAD: United Nation Conference on Trade and Development

USTR: office of United States Trade Representative

WEF: World Economic Forum

WIPO: World Intellectual Property Organization

WTO: World Trade Organization

CHAPTER 1

INTRODUCTION

The potential productivity-enhancing role of spillovers from Foreign Direct Investment (FDI) is a matter of considerable importance for host countries. In as early as 1960s, policy makers across a small number of countries (e.g. Netherland, Ireland, Indonesia) with a view to overcome both investment and knowledge gaps started to make regulatory and policy changes to entice multinational firms to invest in their countries. Invigorated by the findings of positive FDI spillovers of seminal work by Caves (1974) for Australia, Globerman (1979) for Canada, and Blomström (1986) for Mexico, and encouraged by international organisations such as the GATT and World Bank and regional organisations such as the EU, such FDI liberalisation soon spread to other countries in 1970s and 1980s, and then accelerated its pace from 1990 to 2007. By the end of 2007, the total number of international investment agreements rose to more than 3067 (UNCTAD 2015:106). Those IIAs together with national investment policies, a majority of them in favour of FDI, led global FDI flow to reach its peak of $1.49 trillion in 2008 and contributed to its recovery thereafter.[1]

Alongside this aforementioned policy evolution, a large body of research has devoted attention to the existence and magnitude of FDI spillovers and

[1] Policies that are favourable to FDI mostly include countries offering subsidies and tax breaks to foreign firms (Eapen 2013; Haskel et al. 2007). For instance in 1996 Siemens was offered an incentive package worth of £50 million to locate 1.000 worker semiconductor plant in Tyneside in northeast England. Similarly, in 1994 Mercedes was offered by the State of Alabama an incentive package worth of approximately $230 million for a new plant planning to employ 1.500 workers.

developed an array of rich explanations. FDI spillovers refer to the changes in domestic firms' productivity as a result of the foreign presence in the country. FDI spillovers can take the form of horizontal or vertical spillovers. FDI horizontal spillovers occur when the domestic firms engage in competing activities with the foreign affiliates while both of them operating in the same industry and this interaction brings changes to their productivity (Liu et al. 2009). FDI vertical spillovers occur when domestic firms and foreign affiliates operate in different industries and are divided into backward and forward (Liu et al. 2009). FDI backward spillovers arise when domestic firms supply the foreign affiliates with good and services from the upstream industries (Liu et al. 2009). FDI forward spillovers arise when foreign affiliates sell goods and services to the domestic firms (Liu et al. 2009). The FDI spillovers literature posits 'FDI holds the potential to contribute to increased productivity among domestic firms by providing them with advanced knowledge and technology, by improving the country's infrastructure for private investment, and by motivating domestic firms to improve their business practices' (Spencer 2008). This is because for a firm to be successful in venturing abroad, it must possess a countervailing advantage in the form of proprietary technology and management know-how over domestic firms in a host country. By transferring such advantages from its headquarter to its foreign affiliate, the foreign firm is able to offset its liability of foreignness (LOF) (Hymer 1960; Zaheer 1995). Such proprietary technology and management know-how however, can be leaked to domestic firms because of the public good nature of knowledge (Buckley and Casson 1998). Domestic firms with the necessary absorptive capacity can in turn acquire and utilize foreign affiliates' advanced proprietary knowledge and experience changes to

their productivity. The literature also establishes that theoretically there are four mechanisms through which the domestic firms might acquire foreign affiliates' proprietary knowledge and further their productivity: i) demonstration effects, ii) domestic linkages, iii) labour turnover effects and iv) competition effects (see surveys by, Gorg and Strobl 2001; Gorg and Greenway 2003; Spencer 2008).[2] While there is a general consensus that demonstration, linkage and labour turnover effects lead to positive FDI spillovers to domestic firms, the competition effects are considered to be either positive or negative.[3]Increased competition resulted from the presence of foreign firms can induce domestic firms to reduce their X-inefficiency on the one hand and can drive up domestic firms' average cost curve or drive down domestic firms' market share (in some cases crowd out domestic firms from the market)on the other.

1.1. Generation of FDI spillovers

Following Spencer (2008), this thesis conceptualises the generation of FDI spillover as a three-stage process: i) knowledge transfer/acquisition stage, ii) diffusion stage and iii) absorption stage.

When MNEs invest abroad they create a knowledge pool in order to be able to compete effectively against the domestic firms. This knowledge pool is created by i) the transfer of firm specific assets to their foreign affiliates (Cantwell 2017) and ii) the development of technology by the foreign affiliates inside the host country. Until recently, MNEs tended to create advanced knowledge at their

[2]Gorg and Greenaway (2003) identify two more spillover channels: export and wages pillovers. These two however, overlap with the four channels stated above and they are more suitable for analysing the effect of FDI presence on domestic firms' export share and wage rate.

[3] For instance Barrios and Strobl (2002) find evidence that the demonstration channel enhances FDI horizontal spiilovers and Fosfuri et al. (2001) find support that workers' mobility also increases possibility of FDI spillovers. In contrast Aitken and Harisson (1999) identify that the competition effect leads to negative FDI horizontal spillovers.

headquarters and transfer it to their foreign affiliates worldwide in the form of end products, managerial processes, IPR, marketing and corporate strategies (Almeida and Phene 2004). This process enabled foreign affiliates to overcome the liability of foreignness (Xu and Shenkar 2002; Zaheer 1995) and gain a form of ownership advantage against the domestic firms (Dunning 1993). Nowadays, foreign affiliates show a tendency to specialise in developing particular technologies by combining their existing knowledge (gained through the interaction with the host country) with the knowledge newly acquired by the parent firms; engaging in R&D activities and developing their own knowledge based assets (Chang et al. 2012; Gupta and Govindarajan 2000; Lee et al. 2008; Zander 1997). The acquisition and development of such proprietary knowledge, especially in the form of IPR, aids foreign affiliates to overcome the liability of foreignness as well as offering them a monopolistic/oligopolistic power in the foreign market (knowledge transfer/acquisition stage).

Although foreign affiliates take on measures to safeguard their proprietary knowledge, in many cases it is impossible to avoid some degree of knowledge leakage. Knowledge leakages depends on: i) the public good nature of knowledge; and ii) the opportunistic behaviour of the domestic firms. The public good nature of knowledge suggests that knowledge can be transferred at zero marginal cost and that one party can benefit from the use of the common good (in this case knowledge), without paying full financial benefits to the inventor (Arrow 1962; Kogut and Zander 1993; Magee 1977).

Transaction cost theory (TCT) posits that human beings firstly pursue their own interests before acting collectively and, in order to achieve the maximum benefits, may engage in lurking activities (David and Han 2004;

Williamson1981). Therefore, domestic firms driven by opportunistic behaviour may attempt to acquire the knowledge leaked by the foreign affiliates and use it for their own benefit and potentially against the foreign affiliates. The channels by which the foreign affiliates' knowledge can be diffused to the domestic firms are: i) the demonstration effect, ii) the labour turnover effect; and iii) the competition effect (see Gorg and Greenaway 2003; Liu et al. 2009; Yi et al. 2015). A demonstration effect (also known as imitation effect) occurs when domestic firms identify the key characteristics of the foreign affiliates' end products, know-how, and/or managerial practices, and emulate or adopt them into their own practices, by applying reverse engineering (Gorg & Greenaway 2003; Meyer & Sinani 2005; Yi et al. 2015). The scope of the demonstration effect, depends upon the complexity of the product/process/know-how that is imitated, with simpler processes and managerial practices being easier to imitate (Gorg and Greenaway 2003). Imitation does not always imply that illegal means are used or that IPR per se are violated, it could be that publicly displayed knowledge, such as patent citations, is exploited. A representative example of a demonstration effect is the Xiaomi smart-phone developed using similar technology and characteristics to the iPhone and positioned in the market as the 'Chinese iPhone' and the 'little brother of Apple' (Wong 2012). In this case, any upgrade to domestic firms' knowledge and technological capabilities derived from the demonstration effect, could result in positive FDI spillovers with consequential benefits to domestic firms' productivity (Gorg and Greenaway 2003; Liu et al. 2009).

The second spillover channel is the movement of human capital or labour turnover. Although key strategic positions inside the foreign affiliate are usually

occupied by expatriates, foreign affiliates also need a skilled labour force to carry out day-to-day activities and as such often invest in the recruitment and training of local employees. However, when these employees move to domestically owned firms they carry with them new technological and managerial knowledge acquired by their former employers (Meyer & Sinani 2005; Gorg and Greenaway 2003). In this way, domestic firms are exposed to international high quality practices and technologies, which if implemented can result in productivity gains (Gorg & Strobl 2001; Meyer & Sinani 2005). To minimise the diffusion of their knowledge, via the labour turnover channel, foreign affiliates tend to offer relatively higher salaries to their employees, that domestic firms can rarely match (Aitken et al. 1996; Gorg & Greenaway 2003).

The last spillover channel is the competition. MNEs intensify competition in the sector they are entering by both increasing the volume of competitors and introducing new ways of competing (Meyer & Sinani 2009). To remain ahead of the competition, domestic firms tend to:(i) increase the speed of imitation/adoption of foreign affiliates' technological and managerial knowledge; and/or (ii) use their existing technological and managerial capabilities more effectively and efficiently, to achieve productivity gains (Gorg & Greenaway 2003; Gorg & Strobl 2001; Dimeli and Louri 2004). However, intensive competition has been found to also negatively impact domestic firms' productivity (Aitken & Harrison 1999). MNEs that are able to exploit economies of scale, can offer their products at relatively lower prices and draw demand from domestic firms forcing them to reduce production or target niche markets that MNEs are not interested in operating, thus reducing profits (Aitken & Harrison 1999; Blomstrom & Sjoholm 1999; Dimelis & Louri 2004). Moreover,

when MNEs enter a foreign country they often possess a form of ownership advantage (know-how, IP, technology etc.), in order to overcome the LOF (Hymer 1960; Zaheer 1995). Such ownership advantages may increase the demand for MNEs outputs and decrease the demand for domestic firms' less innovative or reputable outputs. This adverse effect of competition may result in productivity losses for domestic firms at knowledge diffusion stage.

Even in the face of knowledge leakages, the literature stresses the importance of absorptive capacity on the part of domestic firms (Cohen and Levinthal 1989), as a necessary condition for beneficial FDI horizontal spillovers to occur (Cantwell 2017). 'Absorptive capacity includes the ability to internalise knowledge created by others and modify it to fit their own specific applications, processes and routines' (Narula and Marin 2003:23). Only those domestic firms with absorptive capacity, the ability to connect and transform the leaked knowledge in their own context, can benefit from the accumulation of foreign affiliates' advanced knowledge (Cohen and Levinthal 1990; Escribano et al. 2009; Gorg and Greenaway 2003; Meyer and Sinani 2009). In order for domestic firms to absorb the foreign affiliates' proprietary knowledge and benefit from it, they need to have the technological competences to do so (Cantwell 1993; Escribano et al 2009). Domestic firms then also need to identify the new knowledge, transform it to fit their own practices, combine it with their existing knowledge, and apply it to their internal processes (Teece et al. 1997; Zahra and George 2002). The absorption of advanced knowledge can improve domestic firms' R&D capabilities, as well as managerial know-how leading to improved performance (absorption stage).

Guided by the above literature, much of the empirical work attempts to address whether the overall FDI spillovers are positive or negative, 'in a framework in which labour productivity or total factor productivity of domestic firms is regressed on a range of independent variables' (Gorg and Greenway 2003). Though the empirical evidence produced so far on FDI spillovers is mixed, one emerging finding is that FDI spillovers are contingent on: (1) characteristics of domestic firms such as absorptive capacity (e.g. Kinoshita 2001) and ownership type (e.g. Blomstrom and Sjoholm 1999); and (2) gaps between foreign firms and domestic firms such as technological gaps (e.g. Kokko 1992); (3) characteristics of FDI, such as the volume of FDI (e.g. Aitken and Harrison 1999; Sjöholm 1999), foreign affiliates' R&D intensity (e.g. Audretsch and Feldman 1996; Chuang and Lin 1999) and ownership type (e.g. Brouthers 2002; Dimelis and Louri 2002); and (4) host country characteristics, such as trade openness (e.g. Irsova and Havranek 2013; Meyer and Sinani 2009), financial development (e.g. Irsova and Havranek 2013; Meyer and Sinani 2009), and institutional quality including intellectual property rights (IPR)(Irsova and Havranek 2013; Havranek and Irsova 2011; Smeets and de Vaal 2011; Yi et al. 2015). Table 2.1 summarises the results of empirical studies in relation to the aforementioned factors, which will be discussed in detail in the following sections.

Table 2.1 Summary of FDI spillover studies

Authors	Country	Year	Cross sectional/ Panel data	Firm/Industry level data	Results
Developing countries and Emerging Economies					
Aitken and Harrison	Venezuela	1976-1989	Panel data	Firm level	Increased volume of FDI

(1999)					leads to negative spillover effects
Aslanoglou (2000)	Turkey	1993	Cross sectional	Industry level	Increased volume of FDI leads to positive spillover effects
Blomstrom and Sjoholm (1999)	Indonesia	1991	Cross sectional	Firm level	The degree of foreign ownership has an insignificant effect on spillovers
Chuang and Lin (1999)	Taiwan	1991	Cross sectional	Firm level	Domestic firms R&D intensity leads to positive spillover effects
Haddad and Harrison (1993)	Morocco	1985-1989	Panel data	Firm level and industry level	Increased volume of FDI leads to negative spillover effects
Kokko et al (1996)	Uruguay	1988	Cross sectional	Firm level	Intermediate levels of technological gap leads to positive spillover effects
Sjoholm (1999)	Indonesia	1980 1991	Cross sectional	Firm level	Large technological gap leads to positive spillover effects
Takii (2005)	Indonesia	1990-1995	Panel data	Industry level	Increased volume of FDI leads to negative spillover effects
Zhang et al (2010)	China	1998-2003	Panel data	Firm level	Intermediate levels of technological gap leads to positive spillover benefits

		Developed countries			
Barrios and Strobl (2002)	Spain	1990-1998	Panel data	Firm level	Spain: Low absorptive capacity leads to negative spillover effects
Barrios et al (2004)	Greece, Ireland, Spain	1992,1997	Cross sectional	Firm level	Spain: Higher absorptive capacity leads to positive spillover effects
Dimelis and Louri (2002)	Greece	1997	Cross sectional	Firm level	Minority foreign ownership leads to positive spillover effects
Dimelis and Louri (2004)	Greece	1997	Cross sectional	Firm level	Minority foreign ownership leads to positive spillover effects
Keller and Yeaple (2003)	USA	1987-1996	Panel data	Firm level	Higher absorptive capacity leads to positive spillover effects
Meyer and Sinani (2009)	Variety of developedand developing countries	1974-2007	Panel data	Meta-analysis	Countries with moderate degree of institutional quality least benefit from spillovers Openness to trade leads to positive spillover effects Low and high income countries appear to benefit more from spillovers
Irsova and Havranek (2013)	Variety of developedand developing	2000-2011	Panel data	Meta-analysis	Financial development has an

	countries				insignificant effect onhorizontal spillovers Openness to trade leads to negative horizontal spillover effects Stronger IP law protection leads to negative horizontal spillover effects
Havranek and Irsova (2011)	Variety of developedand developing countries	2000-2010	Panel data	Meta-analysis	Financial development leads to negative vertical spillover effects Openness to trade leads to positive vertical spillover effects Stronger IP law protection has an insignificant effect onvertical spillovers
Smeets and de Vaal (2016)	Variety of developedand developing countries	2003-2008	panel	Firm level	Strong IP law protection leads to positive backward spillovers, negative forward spillovers and insignificant horizontal spillovers

1.2. MNEs heterogeneity

The IB literature suggests that when MNEs invest abroad many carry with them firm-specific advantages/ownership advantages in the form of superior technology and know-how in order to overcome the LOF (Hymer 1960; Zaheer 1995). As such, it is often argued that the MNEs' affiliates serve as a carrier of superior technology in the host country (Findlay 1978; Eapen 2012). However, this is not always the case. Whether parent firms will transfer different types of knowledge assets, is dependent on the foreign affiliates' establishment mode in terms of being an R&D, sales, distribution or production centre. In the case where MNEs set up an R&D centre in the host country, advanced technological and managerial know-how is likely to be transferred to the foreign affiliate (Meyer & Sinani 2005; Meyer 2004) via the spillover channels to be diffused to the domestic firms benefiting their productivity. Empirical evidence for East Asian countries (Okabe 2002), the US (Audretsch and Feldman 1996), and Taiwan (Chuang and Lin 1999) suggests that domestic firms that are clustered around R&D intensive foreign affiliates, demonstrate greater innovative capabilities and increased productivity. In the case where the foreign affiliates' operations involve local sales and marketing of imported products, or the manufacturing of products at the later stages of the product cycle, advanced technological and managerial know-how is not necessary and thus is less likely to be transferred to the foreign affiliates (Meyer 2004). As such the knowledge diffused and assimilated by the domestic firms will be of limited value causing no or minor changes to their productivity.

The degree of foreign ownership in an international investment is another factor potentially affecting FDI spillovers. The ownership type that MNEs adopt abroad

is influenced by the host country conditions (institutions, market size, etc.) and the related transaction costs involved (Brouthers et al. 2003). MNEs opt for the ownership type that allows them to: (i) protect proprietary rights (and ownership advantage), which cannot be fully contracted out due to the public good nature of knowledge (Dimelis and Louri 2002; Puck et al. 2009); and (ii) minimise their monitoring costs (Dimelis and Louri 2002). The degree of foreign ownership (majority ownership, minority ownership, JV or wholly owned) is likely to influence the willingness of parent firms to transfer knowledge intensive assets (ownership advantage) to their foreign affiliates. Under shared ownership, imitation of MNEs' technological and managerial know-how is easier since domestic partners are involved in the investment and the shared ownership gives domestic partners access and control over the partnerships' assets (Dimelis and Louri 2002; Puck et al 2009; Brouthers et al 2003). In wholly owned affiliates, misappropriation of MNEs' assets is highly unlikely (unless knowledge leaks to the market) (Blomstrom & Sjoholm 1999). Therefore, as foreign ownership decreases domestic partners gain more control over the investment and are more likely to be able to access the MNEs' advanced knowledge with public good characteristics. In such cases, MNEs' uncertainty and monitoring costs increase and although they may transfer advanced managerial know-how to the shared investment, they may withhold the transfer of advanced technological know-how or transfer near obsolete technologies. Nevertheless evidence suggests that productivity spillovers for domestic firms will be stronger when foreign affiliates have a minority ownership type of investment (Dimelis and Louri 2002).

1.3. Domestic firms' heterogeneity

Wang and Bloomstrom (1992) suggest that the majority of FDI spillovers do not arise automatically from the mere presence of foreign affiliates in the country. One factor affecting the spillover benefits is the level of domestic firms' absorptive capacity. As such domestic firms need to invest in learning activities and in the upgrade of their existing technological and managerial competences (Liu et al. 2000) before being able to absorb and benefit from the foreign affiliates' knowledge. Firms with low absorptive capacity rarely benefit from spillovers, as they don't possess the minimum threshold level of technological and managerial knowledge needed to absorb foreign affiliates' diffused knowledge (Eapen 2012; Haskel et al. 2007). Domestic firms with higher levels of absorptive capacity can connect their existing knowledge with that newly acquired, modify and incorporate it in their own context (Eapen 2012; Barrios et al. 2004; Barrios and Strobl 2002) increasing the spillover benefits.

Technological gap refers to the extent foreign affiliates are technologically advanced compared with domestic firms (Zhang et al. 2010). When the technological gap is too small, it means that both domestic and foreign firms possess similar technological and managerial knowledge and thus the former have little to learn from the latter, resulting in little impact on the domestic firms' productivity (Dimelis 2005). As the technological gap widens, domestic firms with relatively high absorptive capacity can access and incorporate the MNEs' advanced and new knowledge into their own practices and experience productivity gains. However, when the technological gap is too wide, domestic firms will be unlikely to benefit from the foreign firms' presence, because the technological and managerial competences of the domestic firms will be

insufficient to fully exploit the MNEs' advanced knowledge (Blomström and Sjöholm 1999; Liu et al. 2000).

1.4. Institutions and IP systems

From an economics perspective, institutions are considered primarily to control the transaction costs associated with the incompleteness of all contracts (North 1992; Williamson 1981). Indeed, institutions in a society begin to matter when transactions costs increase (North 1992). According to transaction cost theory, humans and consequently organisations suffer from bounded rationality that is, they do not possess all the necessary information or cannot predict any future events when developing a contract (Williamson 1981). As a result all contracts specifying a particular transaction between actors or organisations are bound to be incomplete increasing contracting, monitoring and enforcement costs (transaction costs) (Williamson 1981). Taking into consideration the incompleteness of all contracts and the public good nature of knowledge, it is difficult to specify and protect IP using only contracts between organisations. Consequently, IP laws were developed to protect IP owners' rights, but whether IP laws alone achieve this protection is questionable. The literature suggests that, it is the enforcement of IP law that allows IP owners to uphold their rights in case of violation. For instance,

> '[A]ny reference to or an examination of an IP system should be interpreted in respect of proper enforcement and consequently as an interpretation and examination of the content and adequacy of IP laws and regulations', (Maskus 2004:22).

> ‘[A]nation can have strong laws or weak laws, but unless those laws are enforced they are virtually non-existent in terms of the protection afforded IP owners and investors’ (Ostergard 2000:353).

This study conceptualises the IP system as having two distinct elements: a) IP law protection; and b) public IP enforcement (Khoury et al. 2014; Peng et al. 2017a). IP law protection relates to the availability of IP law as this appears in the statutes of a country’s legislative framework. Public IP enforcement relates to the decision of public enforcement authorities (such as the judiciary, police, customs, border control, law firms) on whether or not to enforce the IP law protection in practice in the case of IP violation (Papageorgiadis et al. 2014). From the discussion so far, it can be argued that the strength of an IP system is subject to both the availability of IP law protection and also the effectiveness of the public enforcement agents when enforcing the legal framework.

IP systems are increasingly considered important in today’s digitised networked world. Firstly, effective IP systems allow inventors to appropriate a share of the benefits of their creative activities and thus offer incentives to undertake the costly and risky investments in R&D activities that generate new knowledge and technologies. This in turn increases the global pool of knowledge, as well as induces the demand for new knowledge and technologies. Second, innovation (in the context of new technologies) is said to promote countries’ economic growth and welfare, leading to the suggestion that effective IP systems stimulate economic activity and generate substantial employment in both developing and developed nations (Falvey and Foster 2006; WIPO 2014; ICC and WIPO 2011). Third, effective IP systems are said to increase the attractiveness of countries for raising levels of inward FDI, fostering technology

transfer from developed to developing nations, and also promoting innovation in less developed nations (ICC and WIPO 2011). Fourth, for a firm the ownership of IP is often viewed as its differential advantage that offers it monopolistic/oligopolistic power both in home and host markets (Hall 1992; Hsu and Ziedonis 2013; Reitzig 2004).

1.4.1. Development of global IP systems

The global IP system has come a long way. During the early economic development period in the 18th and 19th century, IPR violation was widespread (Peng et al 2017). A typical example is the United States IP systems, which protected domestic authors and inventors to some degree, but granted no IPR to foreigners (Peng et al 2017). This made the US a leading IPR violator in the 19th century often misappropriating British technological designs and authors (Peng et al. 2017). However, in the long run as these economies developed global isomorphism pressures grew, pushing countries to enhance their IP systems (Meyer et al. 1997), to protect both domestic and foreign IPR and strengthen IPR enforcement in case of violations. Nevertheless inconsistencies among countries' IP laws and IP enforcement were still evident. For instance, in some countries patent rights were granted for a particular invention while in other countries the same patent received no protection. In order to address issues arising from differences in each country's IP systems, harmonisation of countries' IP systems at the global level has been a prominent item on the international policy agenda for years (Javorcik 2004). The evolution of the quality of national IP systems over the last 20 years Hs been strongly influenced by the TRIPs agreement introduced by the WTO among its member countries (Papageorgiadis and McDonald 2018). The TRIPs agreement sets the minimum

standards for IP law protection among WTO member countries (WTO 2015) but did not set obligations regarding the way IP laws should be applied in case of violations (Papageorgiadis and McDonald 2018). From 1996, developed countries were required to incorporate the TRIPs changes in their legislative framework within one year, while developing countries were required to implement them within a 5-year period ending on 1st January 2000. The additional time was granted because many of the developing countries had limited, or in some cases non-existent, IP legal frameworks and proper design and restructuring was necessary. Developing countries and emerging economies were subsequently offered an extension of this deadline to 2006, which was further extended for only least developed countries to the year 2013 and eventually to the 1st of July 2021 (WTO 2017). Despite the introduction of the TRIPs agreement, many emerging economies (such as China) implemented the suggested changes in their legal frameworks, but were reluctant to strengthen their public IP enforcement (Peng et al. 2017b; WTO 2017).

The reasons why certain countries resisted the strong IP enforcement could be due to:(1) cultural inheritances, and (2) costs-benefit analysis (Peng et al. 2017). Institutional theory suggests that informal institutions, including society's ideologies, perceptions and beliefs towards fairness and justice, vary among countries (North 1992). For instance, Chinese culture, influenced by its Confucian past, is conducive to a lack of respect for IPR (Peng et al. 2017). Thus, inherit cultural beliefs may influence state enforcement agents (police, judiciary, courts) not to fully enforce the legal framework when IPR violations occur (North 1992). Moreover when countries decide on the strength of their IP systems they often formulate their decision by conducting a cost-benefit

analysis that is; a strong IP system should outweigh the costs of a strong IP system. The costs of a strong IP system relate to the fact that strong IP law protection and enforcement may limit knowledge spillovers from developed to developing economies (Kumar 2003). This is because strong IP enforcement restricts and penalises the imitative activities of domestic firms and thus the production and sale of substitute products, which is a main source of income for developing economies, ultimately leading to declining productivity and performance (Maskus 2004; Park 2012; Park and Lippoldt 2004). Nevertheless when domestic firms start engaging in R&D and the development of intangible assets, demand for stronger IP law protection and enforcement increases as benefits start to outweigh the costs. This is the case of South Korea, which began to change its IP system in the 1980s when they moved from the imitation of foreign technologies to the development of valuable patented assets of their own, which they had to protect (Kim et al. 2012). For all of these reasons, even after the introduction and implementation of the TRIPs agreement by the majority of WTO countries, there remain inconsistencies in the enforcement of IP law protection (Ostergard 2000).

1.5. IP systems and FDI spillovers

While a large body of research has dealt with the impact of heterogeneity MNEs' and domestic firms on FDI spillovers, there has been comparatively little interest in the effect of institutions on FDI spillovers. Conceptually, as both foreign and domestic firms operate under a specific institutional setting, institutions in the host country could potentially shape the choices, behaviour, interaction and performance of firms and, consequently, influence the FDI spillovers that advantage domestic firms (Smeets and de Vaal 2016; Yi et

al.2015). Empirical evidence supports the theoretical arguments and suggests that the institutional development of the host country influences FDI spillovers in a curvilinear way (Meyer and Sinani 2009). The importance in economic development of IP systems as a form of institution, FDI flows and technology transfer havebeen theoretically and empirically researched (see Branstetter et al. 2007; Maskus et al. 2003; Maskus 2004; Kashcheeva 2013) its effect on FDI spillovers remains the least researched topic (Arora 2009). Recognising the importance of IP protection and enforcement and the lack of empirical evidence ,there has been a call for more research on the role of IP systems in international technology transfer (Arora 2009) and that ‘ It would be instructive ….. to relate the extent of FDI spillovers to IP protection in host countries’ by using ‘firm-level panel data for multiple countries’ or a ‘meta-study of existing empirical work taking into account host country conditions’ (Javorcik 2009:61).

Recently four studies investigated the effect of IP systems on FDI spillovers and produced mixed results. Irsova and Havranek (2013) and Havranek and Irsova (2011) adopted a meta-analysis approach to examine which factors, including IP systems, influence the magnitude of FDI horizontal and vertical spillovers respectively. To approximate for the effect of IP systems they employed the Ginarte and Park (1997) and Park (2008) patent protection index. Their findings showed a negative relationship between the strength of IP systems and FDI horizontal spillovers and an insignificant relationship between the strength of IP systems and FDI vertical spillovers. Alternatively, Smeets and de Vaal (2015) employed a large dataset comprising 81,299 firms in 17 countries using the Ginarte and Park (1997) patent protection index to approximate for the effect of the IPS system, and found that strong IP systems strengthen backward linkage

effects, weaken forward linkage effects and have an insignificant effect on horizontal productivity spillovers. Yi et al. (2015) employed the ratio of settled intellectual property (IP) lawsuits to the total number of IP lawsuits in a region to measure the overall strength of an IP system and found that firms operating in Chinese provinces with stronger IP systems, were better able to absorb FDI spillovers and improve their productivity.

In this thesis, it is argued that the mixed evidence produced by the aforementioned studies may relate to the way the effects of IP systems are conceptualised and empirically tested. Conceptually although the aforementioned studies intend to investigate the IP systems as a whole i.e. IP law protection and public IP enforcement, they only focus on one pillar of the IP systems that of the IP law protection and do not consider variation in the way IP law protection is actually enforced in practice. However, although countries may offer strong IP law protection frameworks (Park 2008; Peng et al. 2017a), the levels IP enforcement vary significantly between countries (Brander et al. 2017; Papageorgiadis et al. 2014). For this reason it is important to conceptualise and account for the IP enforcement element of the IP system, as it is not always the case that strong IP law protection will be accompanied by strong enforceability of the laws. Empirically, the aforementioned studies employed the index of patent protection by Ginarte and Park (1997) and Park (2008) to approximate for the strength of the IP systems as a whole. This index however, does not include a measurement for patent enforcement (Fosfuri 2004; Javorcick 2004; Nichloson 2007; Nunnenkamp and Spatz 2004; Papageorgiadis et al. 2014) as it is only ‘designed to provide an indicator of the strength of patent protection and not the quality of patent systems’ (Park 2008:761). Therefore, the Ginarte

and Park (1997) and Park (2008) indices can be used as a proxy for the strength of patent or IP law protection of a country's patent/IP systems, but not the strength of the enforcement dimension. Studies using measures that do not take IP enforcement into account, may unintentionally overestimate the IP law protection in a particular country (Ostergard 2000). Recognising this, Yi et al. (2015) employed the ratio of settled intellectual property (IP) lawsuits to the total number of IP lawsuits in a region to measure the overall strength of an IP system. Although this measure attempts to approximate for the strength of both IP law protection and enforcement, it does not enable the differentiation of the public IP enforcement from IP law protection. This is problematic for a number of reasons. First, it is unclear if the number of lawsuits resulted from weak IP law protection or inefficient public IP enforcement or both. Second, the way these lawsuits were settled is not specified. In other words for the resolution of conflict between the IP owners and the infringers, official enforcement procedures may have been followed (court procedures that enforced the IP legislation), but also lobbying activities or other informal agreements may have taken place. Therefore, the efficiency and effectiveness of the public IP enforcement agents is not clearly measured. So far it is evident that the existing literature fails to uncover the distinct effect of stronger public IP enforcement, though it fully captures the effect of IP law protection on FDI spillovers.

This thesis aims to responds to Arora's (2009) and Javorcik's (2009) call and to address the gap in the FDI spillovers' literature by conceptualising and testing for the distinct effect of public IP enforcement. It sets to answer two research questions, namely; **RQ1**: What are the effects of the IP law protection and public IP enforcement on FDI horizontal spillovers?; **RQ2**: What are the effects

of the IP law protection and public IP enforcement on FDI vertical spillovers? In order to address these research questions the first two empirical studies of this thesis conceptualise and test for the distinct direct and moderating effect of public IP enforcement on FDI spillovers by employing a meta-analysis of 49 and 27 published and unpublished studies on FDI horizontal and vertical spillovers respectively.

1.6. IP systems and FDI flows

In addition to the dearth of research on the effect of IP systems on FDI spillovers, there has been limited focus on the FDI determinants in the literature to unpack the effect of public IP enforcement on FDI flows from that of IP law protection. In respect to the role of IP systems on inward FDI, the majority of prior research suggests that MNEs tend to invest in countries with stronger IP law protection. For instance, when controlling for the effect of IP law protection as IP law protection is strengthened in the host countries, inward FDI also increased, was found in studies by Puttitanum (2002)for 62 developed and developing countries; Adams (2010) for 75 developing countries; Awokose and Yin (2010) for China; Khan and Samad (2010) for 14 developing South and Southeast Asian countries; McCalman (2004) for 40 developed and developing countries; Bascavusoglu and Zuniga (2005) for 38 developed and developing countries; Kashcheeva (2013) for 103 developed and developing countries; and Branstetter et al. (2007) for 16 developing countries, to name a few. However, conflicting evidence is presented by Nicholson (2007) for 43 developed and developing countries, who found evidence that as the IP law protection becomes stronger, licensing tends to be preferred over FDI; and Fosfuri, (2004) who investigated5,962 firms in the chemical industry across the

world and failed to identify a significant relationship between IP law protection and inward FDI.

Although a decisive factor, only a few studies control for the effect of public IP enforcement on inward FDI, employing enforcement indices that use qualitative data for their construction, such as the World Economic Forum (WEF) and the Institute of Management Development (IMD) index.[4] Studies have used such an index for the overall IP protection and found that IP protection is positively associated with inward FDI, for instance Seyoum (1996) for 27 developed and developing countries; Manfield (1994) for 16 developing countries; Nunnenkam and Spatz (2004) for 166 developed and developing countries; and Park and Lippoldt (2003) for global bilateral FDI. From the discussion so far it is evident that the degree of public IP enforcement in the host country has not yet received much attention from the FDI determinants literature. Although studies capture the direct effect of IP law protection or overall IP protection, they do not conceptualise or empirically test for the distinct and direct effect of the public IP enforcement element of IP systems. To address this research gap, this thesis sets to investigate the distinct effects of the IP law protection and public IP enforcement on bilateral FDI flows in OECD countries (**research question 3**) by employing the gravity model and Poisson Pseudo-Maximum Likelihood (PPML) technique.

Having investigated the existing theoretical and empirical literature on IP systems, bilateral FDI flows and FDI spillovers a major research gap has been identified. That is, the absence of conceptualisation and empirical testing of the

[4] Qualitative indices are subject to the limitations of qualitative data including the non-generalisability and reliability of research findings (qualitative data allows for participant bias) (Saunders et al. 2003)

distinct effect of public IP enforcement on bilateral FDI flows and FDI spillovers. In order to address this research gap, this thesis sets out the following research questions: **RQ1**: What are the effects of the IP law protection and Public IP enforcement on FDI horizontal spillovers?; **RQ2**: What are the effects of the IP law protection and Public IP enforcement on FDI vertical spillovers?; **RQ3**: What are the effects of the IP law protection and Public IP enforcement on bilateral FDI flows in OECD countries?

To address these research questions two leading IB theories are used to inform the research inquiry namely; Transaction Cost Theory (TCT) (Coase 1937; Williamson 1981) and institutional theory (North 1990; 1991; 1992). TCT attempts to identify the transaction costs present in a transaction and the conditions that minimise them (David and Han 2004). TCT is employed in IB research extensively to identify the most suitable governance and entry mode firms should adopt. Building upon two central assumptions of opportunism and bounded rationality, TCT is employed in this thesis to identify the magnitude of MNEs' transaction costs when entering and operating in a specific institutional setting. To understand the influence of the host country's institutional environment, institutional theory is employed. Institutional theory emphasises the importance of formal and informal institutions and the interplay between them, suggesting that in markets with excessive transaction costs institutions will govern actors' transactions (North 1992). This is so because institutions will reduce uncertainty for different actors by conditioning the rules of behaviour and defining the boundaries of what is legitimate (Peng et al. 2009). The importance of institutions in MNEs' activities stems from TCT's core assumption of the incompleteness of all contracts (as a result of the bounded rationality of

humans), where MNEs need to rely on formal and informal institutions and their enforcement mechanisms to protect their residuals rights in case of violation. This thesis builds on the TCT's central assumptions by postulating that domestic firms driven by opportunism will attempt to access MNEs' advanced technological and managerial know-how in order to benefit and increase their productivity. Coupled with the incompleteness of all contracts, MNEs are bound to face high contracting, monitoring and enforcement costs when investing in a foreign market. This thesis argues that the opportunistic behaviour of actors, the incompleteness of all contracts and thus MNEs' transaction costs can be limited,if host countries offer well developed institutions and strong IP systems. By exploring the interplay between these two theories the hypotheses in Chapters 3, 4 and 5 are formed with the main argument being that the level of IP law protection (formal institutions) and/or IP enforcement (formal and informal institutions) in the host country influence MNEs' transaction costs, attractiveness of the host country, diffusion of MNEs' knowledge and consequent spillover benefits.

By addressing the above research questions this thesis seeks to make the following contributions to the literature. First, building upon and extending the existing literaturethat suggests, 'any reference to or an examination of an IP system should be interpreted in respect of proper enforcement and consequently as an interpretation and examination of the content and adequacy of IP laws and regulations' (Maskus 2004:22), by differentiating between the two aspects of an IP system i.e. IP law protection and public IP enforcement. Specifically, this thesis integrates the established theoretical and empirical frameworks with the distinct effect of the public IP enforcement element of IP

systems on FDI spillovers and FDI flows. The incorporation of the public enforcement element of IP systems allows for the identification of a new IP institutional mechanism affecting FDI spillovers and FDI flows, which previous literature has ignored or assumed to be identical with the strength of IP law protection. Moreover, in respect to the FDI spillovers chapters, this study sheds light to another uncharted area in the literature, the moderating effect of the public IP enforcement on the relationship between strong IP law protection and FDI spillovers.

Second, for the empirical investigation of the effect of the stronger public IP enforcement in FDI spillovers and FDI flows, a new index developed by Papageorgiadis et al. (2014) is employed in the meta-analytic model and used to approximate for the effect of public IP enforcement. Incorporating Papageorgiadis et al.'s (2014) international patent systems strength (IPSS) index in the empirical investigation alongside the Park (2008) patent protection index, allows for the first time to account for the effect of both IP law protection and public IP enforcement on the FDI spillovers and on the FDI flows. Compared with the existing available IP enforcement indices (e.g. the index developed by the World Economic Forum (WEF) or the Institute of Management Development (IMD)), this index has the following strengths. First the composite IPSS index captures a number of different enforcement related aspects of patent systems. These different dimensions include:(1) the quality of patent administration, (2) judicial enforcement, (3) the level of corruption in judiciary, (4) the effectiveness of police enforcement, (5) the strength of border controls, (6) the perception of patent owners about national patent legislation and enforcement levels, (7) the cultural and societal attitudes towards the purchase

of infringing goods, and (8) the level of public commitment to patent legislation (Papageorgiadis et al. 2014). Other indices, for instance the WEF enforcement index, capture the availability of IP law protection and the strength of one enforcement related aspect of IP systems in this case the managers' perception towards IP law protection and enforcement in the countries they operate. As such the composite IPSS index allows approximating for more than one aspect and enables researchers to more holistically capture the strength of public IP enforcement. Second, the IPSS index is developed by following a consistent methodology recommended by the Organization for Economic Co-operation and Development (OECD) in Constructing Composite Indicators. Third it is fully transparent and annually longitudinal. Fourth, it is built on transaction cost theory, which is also one of the foundational theories that aid in the development of the theoretical arguments in this study.

The third contribution lies in the methodological approach followed for the meta-analytic investigation of the FDI spillovers. The majority of meta-analytic studies on FDI spillovers, employ either the t-statistics or semi-elasticities as their dependent variable.[5]However, because of the high level of variation in variable selection, estimation method and data source in existing studies, it is almost impossible to calculate dimension-free parameters such as semi-elasticity with a sufficient level of accuracy. The t-statistics (t-stats) is a dimension-free parameter but only the significance of the focal variable derived by comparing the t-stats from the empirical result with the corresponding critical t from the t

[5]Given that the dependent variable is rarely measured identically across studies, the differences in means need to be standardised in order to be comparable. Due to the lack of information, many researchers collect the t-statistic or the semi-elasticity to compare group means. To achieve standardisation researchers often use the pooled standard deviation or the pooled sample size weighted standard deviation or the control group standard deviation methods. However, many studies do not include the necessary information needed for the formulae above, so instead researchers collect either the t-statistics or calculate the semi-elasticity.

distribution table, has important economic meaning. For example, both a t-stat of 3.5 and a t-stat of 4.5 for the FDI presence variable in FDI spillovers studies, are seen as evidence of positive FDI spillovers since they are larger than the critical t of 1.66 at 5% significance level (assuming the degree of freedom is greater than 100 as with most of FDI spillovers studies). The difference between the two however, only reveals a very marginal difference regarding the presence of positive FDI spillovers. Moreover, the researchers in the field of FDI spillovers and policymakers are more interested in the presence of FDI spillovers , where even in cases that magnitudes of FDI spillovers variable coefficients are small, the magnitude of FDI's impact on the productivity of host country domestic firms is still respectable(Irsova and Havranek 2013),. This study employs the ordered probit model regression, in which the significance of the FDI presence variable (coded as 0 significantly negative, 1 insignificant and 2 significantly positive) is used as the dependent variable. Because the estimated coefficients from an ordered probit model should not be used for inference, the marginal effects are also calculated (Verbeek 2017). Under this framework the marginal effects show the change in the probability of finding a specific outcome. This means that for each of the independent and control variables in the model, the change in the probability of obtaining a significantly negative, an insignificant, and a significantly positive estimate is calculated (Koetse et al. 2009). This approach has been used in other meta analyses, for example De Groot et al. (2015) on agglomeration externalities, Card et al. (2010) on the effectiveness of active labour and Koetse et al. (2009) on the impact of uncertainty on investment behaviour.

The last contribution of this thesis relates to the methodological approach employed for the investigation of the role of IP law protection and public IP enforcement on bilateral FDI flows. The Poisson Pseudo-Maximum Likelihood (PPML) estimation method is introduced which so far has mainly been used to estimate bilateral trade flows. This method has the following advantages over other methods. First, this method reduces (potential) bias in estimating the parameters of a log-linearised model by OLS, or other standard panel data estimation methods such as fixed effect model, since it does not impose strict assumptions on the independence of an error term and the form of a dependent variable (Silva and Tenreyro 2006; Arvis and Shepherd 2013). Second, the empirical study of bilateral FDI flows resemble the study of bilateral trade flows in terms of both model specification (the gravity model or semi-gravity model is commonly used) and data recording (a proportion of bilateral trade or FDI are not 0 and recorded as 0 which leads to data truncation errors). Finally, this method can be easily implemented using standard econometrics software such as STATA where the results from this method can be easily interpreted (i.e. coefficients and elasticities).

THESIS OUTLINE

Chapter two presents a literature review on the key concepts and theories used in this thesis. In particular definitions and background research are provided for the IP systems, FDI determinants and FDI spillovers. Moreover, the institutional theory and the transaction cost theory are discussed in relation to their effect on the aforementioned concepts.

In Chapter 3 this thesis addresses **RQ1** and investigates the effect of IP law protection, public IP enforcement and the moderating effect of public IP enforcement on FDI horizontal spillovers. Specifically, Section 3.2 reviews the literature on IP systems while it emphasises the importance of distinguishing between the two pillars of an IP system i.e. IP law protection and public IP enforcement. Building upon the transaction cost and institutional theory three hypotheses are developed and tested with the use of a meta-analysis (section 3.3). In section 3.4 the methodology and data are described accompanied by a description of the variables definitions. The main part of section 3.5 consists of the presentationand discussion of the results. Lastly, policy implications and direction of future research is provided in section 3.6.

Chapter 4 addresses **RQ2** and examines the effect of IPlaw protection, public IP enforcement and the moderating effect of public IP enforcement on FDI vertical spillovers and follows a very similar conceptual and empirical approach (meta-analysis) to Chapter 3.

While Chapters 3 and 4 deal with the relationship between IP systems and FDI spillovers, Chapter 5 takes a more general approach in order to address **RQ3** and investigates the distinct effect of IPlaw protection and public IP enforcement

on the bilateral FDI flows in OECD countries. A panel of data for 30 OECD countries over the period 2001 to 2012 is used for the empirical study. It begins with an assessment of the existing studies while it identifies their major limitation (i.e. public IP enforcement is not always accounted for) and moves on to the development of two hypotheses. Section 5.3 describes the methodological approach of this study; being the employment of the gravity model and the Poisson pseudo-maximum-likelihood (PPML) technique while it is accompanied by a description of the variables definitions. The main part of section 5.4 consists of the presentation and discussion of the results. Lastly, policy implications and direction of future research is provided in section 5.5.

Chapter 6 offers overall conclusions of the thesis and discusses the major limitations of Chapters 3, 4 and 5.

CHAPTER 2

REVIEW OF THE LITERATURE: THE KEY THEORIES UNDERPINNING THIS THESIS

This thesis aims to empirically investigate the relationships between Intellectual Property Rights (IP) systems, FDI flows and FDI spillovers.

The effect of FDI flows and FDI spillovers on the host countries' prosperity has been at the forefront of International Business (IB) research for decades. However, whether inward FDI and its externalities positively or negatively influence the host country remains an issue that has not been fully addressed. There are varying perspectives and views on this issue, some of which posit a positive relationship and others a negative relationship (Crespo and Fontoura 2009; Gorg and Strobl 2001; Gorg and Greenaway 2003; Meyer and Sinani 2009). Empirical research provides inconclusive results when the role of institutional factors, such as the IP system of the host country, is included in the discourse. To shed light on these issues two leading IB theories, transaction cost theory (TCT) (Coase 1937; Williamson 1981) and institutional theory (North 1991), are applied to develop the hypotheses in this study (Chapters 3, 4, and 5). In particular, transaction cost theory is employed to investigate MNEs' transaction costs when investing in a foreign market. Complementing TCT, institutional theory is used to identify how country level factors such as the strength of the IP system, can influence MNEs transaction costs and consequently attractiveness of the host market, levels of inward FDI (Chapter 5) and the possibility of FDI spillovers (Chapters 3 and 4).

2.1. Transaction cost theory

In neo-classical economics the firm is seen as a black box that receives inputs in the form of land, capital and labour and yields outputs in the form of goods/services with the goal of generating profits (Alchian and Woodward 1988; David and Han 2004; Martins et al. 2010). Transaction cost theory (TCT) challenged the neo-classical perspective and shed light on this black box by suggesting that factors such as the appropriate governance mode could maximise firms' efficiency, by confining their transaction costs (Coase 1937; Williamson 1979 1981). Transaction costs relate to the development, monitoring and enforcement of contracts between two parties (Alchian and Woodward 1988; David and Han 2004). TCT, by following the Pareto efficiency principle, assesses governance modes' ability to facilitate transactions up until the point where one extra transaction within the firm, will equal the costs of transacting with the market (Martins et al. 2010). Resting upon two assumptions of bounded rationality and opportunism, TCT recognises the incompleteness of all contracts and explicates that transaction costs may occur in the development, monitoring and enforcement of contracts between the parties (Alchian and Woodward 1988; David and Han 2004).

2.1.1. Assumptions of TCT

In order to identify the source of transaction costs, TCT introduces two fundamental assumptions: i) opportunism, and ii) bounded rationality (Williamson 1979,1981).

Bounded rationality suggests that humans are incapable of assimilating and processing excessive amounts of information (Williamson 1981). This attribute

makes all contractual agreements incomplete (Alchian and Woodward 1988), as humans are not able to predict the occurrence of future events and the responses to them beforehand in order to include them into the contracts (Alchian and Woodward 1988; Williamson 1981). As such contracting, monitoring and enforcement costs are generated, in order to avoid any fraudulent activities (Aubert et al. 2004; David and Han 2004; Williamson 1981 1988).

Notwithstanding the incompleteness of all contracts, transaction costs could be zero if humans were trustworthy and not opportunists (Williamson 1981). Opportunism suggests that before or after the two parties agree on a contract, they will exhibit some deceitful behaviour (Aubert et al. 2004; David and Han 2004; Williamson 1981). This assumption is built upon the psychological perception that humans will firstly pursue their own interests before acting collectively and thus may engage in lurking activities to maximise their benefits (Aubert et al. 2004; David and Han 2004; Williamson 1981). As such contracting, monitoring and enforcement costs are most likely to occur.

In the context of this study, foreign affiliates may experience contracting costs when investing in the host country via the acquisition of existing firms, or by the formation of joint-ventures with the domestic firms. Monitoring costs arise from the opportunistic nature of the contracting parties. These costs occur when the foreign affiliates scan the marketplace to identify cases of illegal use of their proprietary knowledge and when they monitor the contracting parties' behaviour in order to avoid any break down or violations of their agreement (Clegg and Cross 2000; Papageorgiadis et al. 2014). Finally, if contravention occurs foreign affiliates need to enforce the terms and conditions of the contracts, mainly via

the judicial system, resulting in enforcement costs (Clegg and Cross 2000; Papageorgiadis et al. 2014).

2.1.2. Determinants of Transaction Costs

Williamson (1979) argues that three conditions will impact the magnitude of transaction costs: i) asset specificity, ii) uncertainty and iii) frequency of transactions.

Asset specificity describes organisational assets that have added values. Specific assets include physical assets (specialised machinery, technology, IPR); site assets (appropriate locations convenient for dealing with other parties); and human assets (mostly referring to employees' tacit knowledge and know-how) (Aubert et al. 2004; David and Han 2004; Geyskens et al. 2006). The classification of an asset as specific, is done by calculating the difference between the cost of the asset and the value of its second best use (Aubert et al. 2004; David and Han 2004; Geyskens et al. 2006).[6] In the case where specific assets are being transacted, transaction costs increase as both parties have incentives either to protect the value adding assets or to act opportunistically and take advantage of them (Williamson 1979 1981 1988). Long-term contracts with volume guarantees and strict terms and conditions are developed to ensure the safety of their investment (David and Han 2004; Geyskens et al. 2006). Consequently, contracting and monitoring costs increment in the effort of capturing and avoiding any potential opportunistic behaviour that may lead to a breakdown in their co-operation.

[6]For instance, patents are classified as specific assets since they have no alternative use and can only be exploited in the areas that they are granted.

Uncertainty arises from the incompleteness of all contracts due to: (1) the bounded rationality of humans, and (2) the imperfect information in the market place (Aubert et al. 2004; David and Han 2004; Geyskens et al. 2006; Williamson 1981). The incompleteness of contracts gives rise to monitoring and enforcement costs (Hart 1988; Weber and Mayer 2014). A newly introduced type of uncertainty, interpretive uncertainty, argues that uncertainty thrives from the way each individual interprets an unanticipated contingency (Weber and Mayer 2014). Because each individual has their own subjective manner in perceiving, explaining and reacting to an occurring event, transaction costs will vary accordingly. Uncertainty in the terms defined above, is always considered present in the firms' transactions. TCT argues that uncertainty only poses problems when specific assets are being transacted (David and Han 2004). This is so because uncertainty leaves space for expropriation of assets and in the case of specific assets firms may encounter transaction costs in the form of contracting, safeguarding and enforcement.

Frequency of transaction refers to the degree the firm's transactions recurring (Geyskens et al. 2006). Frequent transactions with the market require constant monitoring to ensure that all contracting terms are followed, in order to avoid any misappropriation of the assets under transaction (David and Han 2004). In the case where recurring transactions do not concern specific assets, transaction costs are considered negligible and firms make use of the advantages of perfect competition. On the other hand, recurrent transactions of specific assets increase the possibility and opportunities for the contracting party to obtain information about the specific asset, resulting in the rise of transaction costs.

2.1.3. Transaction cost theory and FDI spillovers

In the context of this thesis TCT is applied to identified MNEs' transaction costs when their knowledge is willingly (vertical spillovers) or unwillingly (horizontal spillovers) diffused to the domestic market (recall the 3 stage model in Chapter 1).

When domestic and foreign firms compete in the same industry then, in order to preserve their ownership advantage, the latter have an incentive to prevent knowledge leakages and thus spillovers from taking place. However MNEs' knowledge still diffuses to the domestic firms via the spillover channels. During this process MNEs encounter the following transaction costs. First, MNEs need to draw restricting contracts with their employees prohibiting the share of MNEs' know-how, with their new domestic employers. Such processes give rise to contracting and monitoring costs, as well as enforcement costs if violations of a contract occur. The second source of transaction costs for the MNEs is when domestic firms access MNEs' knowledge via the demonstration channels and either invent around or illegally imitate that knowledge. In this case, monitoring costs arise when MNEs want to ensure that publicly available knowledge is in fact exploited and enforcement costs increase when domestic firms are caught engaging in illegal imitative activities. In the case of vertical spillovers, MNEs transaction costs are relatively low as MNEs willingly share their knowledge with their domestic suppliers in order to gain more advanced and high quality inputs in return (Javorcik 2004). Nevertheless, the MNEs' transaction costs identified above are subject to the quality and effectiveness of the host country's institutions. Well-developed institutions in the host country are thought to reduce MNEs' external uncertainty and transaction costs, provide incentives for FDI

(Bénassy-Quéret et al. 2007; Bevan et al. 2004; Seyoum 2006) and consequently increase the possibility of FDI spillovers. As such, it is argued that strong IP law protection and public IP enforcement will reduce MNEs' transaction costs, increase the attractiveness of the host country and the willingness of MNEs to transfer knowledge intensive assets to their foreign affiliates and thus enhance the possibility for FDI horizontal spillovers.

2.2. Institutional theory

'While transaction cost theory focuses explicitly on intentional and rational decisions, institutional theory also takes into account the social construction of organizational behaviour, and recognizes the limits imposed by social constraints on a purely economic basis' (Puck et al 2009: 392). In general, institutional theory accounts for the role of the institutional environment in MNEs decision-making, such as selection of entry mode, selection of host country, selection of ownership type. (Puck et al 2009). According to North (1991 1992), institutions are the constraints devised by humans that structure political, economic and social interactions and consist of: i) formal institutions, ii) informal institutions, and iii) the enforcement characteristics of both.

Formal institutions refer to the laws and regulations (Peng et al. 2009) imposed by governments that target legal and economic issues (Hodgson 2006; Krammer 2013; North 1991). For instance, constitutional or property rights laws, or any other statutory laws imposed by governments. Contravention of a country's' formal institutions may result in legal penalties, such as fines and legal custody imposed by courts (North 1992).

Informal institutions are culturally derived unwritten codes of conduct, norms of behaviour, and ideologies that individuals possess (Holmes et al. 2013; Krammer 2013; North 1992). Culturally inherited institutions include society's taboos, traditions, customs and shared habits of thoughts that have been passed down from generation to generation (North 1992). Since ideologies and consequently informal institutions are location specific, they tend to differ among countries (North 1992). Non-compliance with informal norms bears social penalties rather than legal penalites and are imposed by members of the society (Hodgson 2006). The degree to which there is an identity between the formal institutional constraints and the choices individuals make, on whether or not to follow them influenced by the informal institutions, depends on the effectiveness of enforcement (North 1992). Enforcement can be carried out by individuals self-imposing the codes of conduct (informal institutions), and/or by a third party such as state officials, courts, the judiciary, legal systems (formal institutions) (North 1992).

According to North (1990) in a world with perfect information, informal institutions would govern everyday life and formal institutions would only make up a very small part of the sum of constraints that would shape actors' choices. This is so because transaction costs would be zero, actors would have no incentives to act opportunistically and enforcement will be self-imposed based on local informal institutions (North 1992). However this is not the case. Firms do not have access to perfect information, and driven by competition often engage in opportunistic behaviours resulting in increased transaction costs. Formal institutions in this case are necessary as they condition the norms of behaviour by defining the boundaries of what is legitimate through legislation

and by outlining the legal sanctions imposed if that legislation is contravened (Peng et al. 2009). But even with the imposition of formal institutions, informal institutions are still shaping the transaction activities since they influence the enforcement of the formal institutions. The mental constructs and the inherited cultural conditioning of the individuals determine their perceptions towards justice and fairness in a society (North 1992). Different countries with different informal institutions have conflicting views of the fairness and justice of formal institutions. If the enforcement of formal institutions could be done at low cost, then it would make little difference whether people believe formal institutions are fair or unfair. But because enforcement of the law is costly, society's ideology matters as it increases or decreases such costs (North 1992). Since enforcement is undertaken by human state enforcement agents in a particular society, enforcement agents' ideologies will determine the strength and effectiveness of formal institutions' enforcement (North 1990). Therefore, the effective enforcement of formal institutions will depend on the ideologies (past experiences, cultural influences etc.) of the relevant enforcement agents on whether or not an action is illegitimate. In cases where informal institutions are not allied with formal institutions and where room for ideological interpretation exists, MNEs' contracting, monitoring and enforcement costs will rise. MNEs cannot rely on common perceptions of fairness to write and enforce contractual agreements, since they differ from country to country (North 1992). Furthermore, because of the high transaction costs involved and the high levels of institutional uncertainty as to whether or not formal institutions will be enforced, such countries may not attract significant foreign investment (Brouthers 2002; North 1991; Yi et al. 2017). To control for such issues, a

country needs to create an institutional environment where formal laws, such as property rights, are specified precisely and the enforcement of such laws is undertaken effectively irrespective of society's ideology (North 1991 1992). In order to achieve this, a country needs to devote significant resources to ensure that enforcement agents are impartial in their judgements and that personal ideological constrains do not obstruct justice (North 1987).

At a macro level, the IB discipline has examined the role of institutions on entry modes, economic growth, and how national level institutions condition the behaviour of domestic and foreign firms (Dunning Lundan 2008; Peng 2002 2003; Brouthers 2002; Puck et al. 2009). At a micro level, Management scholars have focused on exploring the way foreign affiliates seek to gain legitimacy in the host country and how they adapt to isomorphic pressures from the institutional environment in which they operate (Dunning and Lundna 2008; DiMaggio and Powell 1983; Oliver 1999; Kostova and Zaheer 1999). This thesis is concerned primarily with the first stream of literature, which will be discussed in detail in the following chapters. The second stream of literature and research domain is covered briefly below.

2.2.1. Institutional Isomorphism and MNEs' strategic responses

The institutional environment i.e. structure of formal institutions and effectiveness of enforcement mechanism, differs among countries. When MNEs decide to invest in a host country, they face pressures to conform to the institutional environment in order to achieve legitimacy (Puck et al. 2009). In other words MNEs will have to become isomorphic, where they will be forced to resemble the domestic firms that face the same institutional constraints (Puck et

al. 2009; DiMaggio and Powell 1983) and gain the right to do business in the host country by conforming to local norms and abiding by local laws(Puck et al 2009). DiMaggio and Powell (1983) identified three types of institutional isomorphism that MNEs may encounter: (1) coercive isomorphism, (2) mimetic isomorphism, and (3) normative isomorphism (p.150).

Briefly, coercive isomorphism results from pressures to conform to governmental laws and mandates (formal institutions) and from pressures to adapt and adopt to the cultural expectations of the society within which the MNEs operates (informal institutions) (DiMaggio and Powell 1983). Mimetic isomorphism stems from the uncertainty experienced by MNEs when operating in an unfamiliar institutional environment. To cope, MNEs tend to imitate or model themselves on similar domestic and foreign firms in their industry that they perceive to have gained legitimacy and are currently successful (DiMaggio and Powell 1983). Lastly, normative isomorphism is associated with professionalisation that is 'the collective struggle of members of an occupation to define the conditions and methods of their work' (DiMaggio and Powell 1983:152) in order to achieve legitimacy while complying with local cultural norms. To achieve isomorphism IP dependent MNEs will also need to comply with the local IP system in force. A strong IP system consisting of strong IP law and enforcement, will be positively perceived by the MNEs, as it will ensure that their rights will be granted and upheld in case of violation. In such cases, MNEs may transfer their IP assets to their foreign affiliates, which could potentially be diffused to the local firms via the spillover channels. In the case of a weak IP system consisting of strong IP law and weak IP enforcement or weak IP law protection and enforcement, MNEs may be relatively reluctant to conform to

local practices and achieve isomorphism as their IP assets and ownership advantage maybe misappropriated by local firms. MNEs will be exposed to high safeguarding, monitoring and enforcement decreasing their willingness to transfer advanced knowledge to their foreign affiliates, and subsequently decreasing the probability of advanced knowledge diffusion to the market and thus spillovers.

To deal with the aforementioned institutional pressures, MNEs often pursue a variety of strategies such as: (i) acquiescence, (ii) compromise, (iii) avoidance, (iv) defiance, and (v) manipulation (Oliver 1991). Briefly, following an acquiescence strategy MNEs unconsciously take for granted certain norms of behaviour, mimic other firms' institutional models, conform to and incorporate the cultural values and regulatory structures of the host country into its own practices (Oliver 1991). In a compromise strategy, MNEs tend to accommodate the demands of the institutional environment while at the same time negotiating with institutional stakeholders to extract some concessions (Oliver 1991). In an avoidance strategy MNEs want to avoid conformity with the institutional environment. They do so by: (1) attempting to conceal their nonconformity engaging for instance in window dressing, (2) manoeuvre around formal and informal institutions, (3) escape from external inspections, (4) exit the domain within which the institutional pressure is exerted, and/or (4) alter their goals and practices that are subject to institutional conformity (Oliver 1991). Employing a defiance strategy demonstrates an active form of resistance to institutional pressures. Here, MNEs reject the institutional expectations by: (1) dismissing local norms and formal rules (the latter is often pursued when enforcement of formal laws is rather weak); (2) defying, challenging and not complying with

formal laws and local norms (MNEs are prone to do this when their challenge can be reinforced by demonstrating organisational probity and rationality); and/or (3) by attacking and denouncing the institutional pressures when they feel their autonomy, performance, privileges and values are in jeopardy (Oliver 1991). Lastly the manipulation strategy is intended to change the institutional pressures that apply to the MNEs by attempting to: (1) affiliate with the source of the institutional pressure (society or government); (2) influence and possibly change institutional values and beliefs that do not support their practices; and/or (3) establish power and dominance over institutional actors that apply the institutional pressures (Oliver 1991).

In the case of weak IP systems, in order to ensure the safe transfer and exploitation of their ownership advantage, MNEs may use a variety of the aforementioned strategies to deal with the external institutional pressures to conform. In addition whether their advanced IP is transferred or not, will also depend on the effectiveness of their internal mechanisms to safeguard and retain their knowledge inside the firm (de Faria and Sofka 2010; Zhao 2006). Such internal mechanisms can include secrecy measures and constant monitoring of the use of the IP inside the affiliate (de Faria and Sofka 2010). Moreover the MNEs' certain IP components can be held in the home country and be protected under a strong IP system. The acquisition of MNEs' complementary knowledge developed and protected in other countries with effective IP systems, entails high costs that may discourage the domestic firms (Zhao 2006). Lastly, MNEs can discourage imitation by developing technologies that are relatively complex and require complementary knowledge and

resources that is not always available to the domestic firms (de Faria and Sofka 2010; Zhao 2006).

2.2.2. Background to IP systems

The focus of this thesis is on the IP systems, which are part of a country's institutional environment, and their effect on FDI flows and FDI spillovers. In this section definitions on IPR and IP systems are presented.

Intellectual Property (IP) refers to the intangible creations of the mind, such as ideas, artistic works, names, designs, software programs and inventions in general, that if exploited have a commercial value (World Intellectual Property Organization (WIPO) 2014). IP may take the form of industrial property, artistic and literary property or trade secrets (Maskus 2000, p. 37; WIPO 2014). Intellectual Property Rights (IPR) are governmental laws and regulations that allow the creators of IP to commercially exploit their inventions while excluding others from using these inventions without the permission of their creators (WIPO 2014). The IP instruments used to protect IPR vary depending on the IP in question. Industrial property is protected via patents, trademarks and industrial designs, whereas artistic and literary property are protected via copyrights. Trade secrets on the other hand are protected by statutory laws against fair competition (Maskus 2000: 37-38; International Chamber of Commerce (ICC) and World Intellectual Property Organization (WIPO) 2011).

Building on North's (1991; 1992) classification of institutions as formal and informal, this thesis conceptualises an IP system as having two elements: a) the IP law protection (formal institutions), and b) the public IP enforcement (formal and informal institutions) (Khoury et al. 2014; Peng et al. 2017a).This

classification is supported by Maskus (2004:22) who suggests that ‘any reference to or an examination of an IP system should be interpreted in respect of proper enforcement and consequently as an interpretation and examination of the content and adequacy of IP law protection’. Although strong IP law protection offers a legal framework inside which IP can be granted, ‘the real issue is whether a country adequately enforces the laws and regulations it has in place’ (Maskus 2004:22) in case of IP violation.

The IP protection element relates to the availability of IP law, as this appears in the statutes of a country’s legislative framework and the enforcement mechanism in case of violation (formal institutions). The range of IP law availability in a country determines which intellectual assets can receive IP protection, the duration of IP protection (e.g. typically 20 years for patents) and outlines the suggested legal sanctions related to the misappropriation of IP rights (OECD 2014). However the availability of IP law protection may vary significantly across countries. For instance, while IP owners may be awarded IP protection in one country, they may not be able to register and protect their rights in another country. Therefore strong IP protection refers to countries that generally provide legislative frameworks that offer IP protection coverage to a wide type of IP assets and outline a variety of legal sanctions relevant to the degree of IP violation or misappropriation (Ginarte and Park 1997).

However, the extent to which IP law protection is enforced (or not) in practice, is distinct from the existence of enacted laws (Dixit 2009). This issue has been highlighted by the WTO arguing that although many countries such as China offer a strong IP law protection framework, public IP enforcement is found to be weak (Papageorgiadis et al. 2014; Peng et al. 2017b).

For this reason, it is important to consider the IP enforcement element of the IP system as it relates to the application of IP law protection by the public enforcement agents when IP laws are violated (Papageorgiadis et al. 2014; WIPO 2014). Enforcement of IP laws is a two dimensional concept involving the institutional capacity together with the institutional will to enforce laws (Ostergard 2000:358). The former relates to the actual enforcement agents needed to enforce the law (the judiciary, state officials such as police and customs) (Ostergard 2000; Papageorgiadis et al. 2014) and the latter relates to the behavioural component of institutions (informal institutions) (Ostergard 2000). In the behavioural component public IP enforcement relates to: (1) the perceptions of the public enforcement agents on what constitutes an illegitimate activity; and (2) the effectiveness of the IP administration systems that are also influenced by local ideologies. Such classification is supported by North (1990 1992), who suggests that since enforcement is undertaken by humans, their personal informal beliefs on fairness and justice can influence the outcome. The administrative IP enforcement involves the effectiveness and efficiency of the governmental bodies that grant IP, administer IP legislation and examine IP applications. For instance, if the host country's informal institutions favour or at least do not restrict the production and consumption of infringed goods, public IP enforcement agents responsible for enforcing the relevant legislation, may have a more tolerant attitude towards IP infringement (Kafouros and Aliyev 2015).[7]Similarly, even if an IP law framework in a host country includes laws that enable punitive sanctions to IP infringers, these may never be utilised by the judiciary or enforced in practice by the customs officials if the enforcement

[7]It has been observed that although some countries (such as China) may have strong IP protection laws they rarely enforce them (Keupp et al. 2010)

agents allow their personal ideological constraints to obstruct justice. Since ideologies and informal institutions differ among countries, often the same IP laws in two different countries may be applied differently, depending on the way that the IP law is decoded and interpreted by the IP enforcement agents of the country (e.g. punitively in one country and non-punitively in another). Therefore strong public IP enforcement implies that the relevant public IP enforcement agents effectively seize and prosecute IP infringement, the judiciary independently and transparently apply the IP laws in practice awarding fair legal sanctions (Butterton 1996; Maskus 2004; Pajunen 2008).To summarise, the strength of an IP system is reliant on both the availability of IP laws and their effective enforcement by the public enforcement agents.

2.2.3. IP systems and FDI spillovers

The institutional pressure applied to MNEs when entering a foreign market and the quality of the institutional environment may affect the generation of FDI spillovers by: (1) obstructing or enhancing the transfer of specific assets such as proprietary knowledge, from the parent firm to the foreign affiliates; and (2) by influencing the diffusion of foreign affiliates' knowledge to the domestic market (see 3 stage model in Chapter 1).

In the cases of weak IP systems external uncertainty increases as domestic competitors driven by competition may engage in opportunistic behaviours and attempt to illegally acquire information for the specific asset under transaction (i.e. foreign affiliates' IP) (Geyskens et al. 2006). As such foreign affiliates' contracting, monitoring and enforcement costs increase. In this case the attractiveness of the host country decreases and parent firms may be reluctant

to transfer advanced technological and managerial know-how to their foreign affiliates and instead transfer old or soon to be obsolete knowledge. In turn domestic competitors will not be exposed to advanced technological and managerial know-how and therefore may experience insignificant or negative FDI horizontal spillovers, due to a competition effect. Furthermore, since parent firms may not transfer high quality knowledge to their foreign affiliates, the knowledge that foreign affiliates may share with their domestic suppliers/buyers will be of inferior quality and domestic suppliers/buyers may not experience any significant changes to their productivity.

The effect of strong IP systems on FDI spillovers can be positive and negative. On the one hand strong IP systems limit external uncertainty as they ensure IP owners that their rights will be granted and upheld if necessary. As such transaction costs decrease and attractiveness of the host country increases, as does the amount and quality of knowledge that is being transferred to the host country. In such cases, foreign firms may create more joint-ventures with the domestic firms or increase the amount of licensed IP, thus enhancing the legal diffusion of their proprietary knowledge. Moreover a strong IP system (i.e. availability of IP law protection and effectiveness of public IP enforcement) creates incentives for foreign and domestic firms to engage in the development of advanced technology/knowledge, by assuring the IP owners that their rights will be granted and upheld in case of violation. Making use of the demonstration channel, domestic firms with the necessary absorptive capacity can access foreign firms' publicly displayed information (patents), incorporate it into their practices and potentially increase their productivity. As suggested by Levin

(1988), positive FDI spillovers are observed when domestic firms acquire advanced technological know-how through patent disclosures.

On the other hand, strong IP systems block the labour turnover channel, illegal demonstration channel and the competition channel (for more details see section 3). Strong IP systems restrict the opportunistic behaviour of domestic competitors to illegally acquire assets under transaction, as they allow IP owners to take legal action against the infringers and enforce their rights. In this case the illegal diffusion of foreign affiliates' knowledge decreases and domestic competitors may experience the adverse effect of competition. While such potentially negative effects of strong IP systems on FDI spillovers may well exist, the overall net effect still could be positive. Since strong IP systems offer incentives to firms to engage in innovative activities, domestic firms could engage in R&D and develop their own advanced technologies, in this way increasing their productivity (Krammer 2015; Levin 1988; Yi et al. 2015).

2.3. Foreign Direct Investment (FDI)

Chapter 5 aims to address **RQ3** and investigates the distinct effect of IP law protection and public IP enforcement on bilateral FDI flows in OECD countries. This section provides a brief review on the key FDI determinants focusing on the institutional quality of the host country while it identifies areas of improvement that this study aims to make.

According to Dunning (1993) three conditions must be satisfied for FDI to occur.[8] The firm must possess an ownership and internalization advantage

[8] Foreign Direct Investment (FDI) refers to an investment made by an enterprise operating in one economy with the goal of acquiring controlling interest in an enterprise currently operating or soon to operate in another economy (OECD 2018). A threshold of 10 per cent of equity

while the host country must offer a location advantage. When MNEs invest abroad they are at least initially disadvantaged to local firms whose knowledge on local market conditions is excessive (liability of foreignness) (Javorcik 2004). Therefore MNEs must possess a form of ownership advantage such as; superior production technology, managerial and technological know-how, innovatory capacity, reputation, and/or intangible assets such as IPs, to surpass their liability of foreignness and compete effectively with domestic firms. Internalization refers to the advantage of owning, controlling and coordinating ownership advantages within the MNE (Dunning 1993). The decision to internalize instead of licensing or exporting has the advantage of lowering transaction costs, minimizing technology imitation, and preserving firms' quality standards across management, production and distribution (Faeth 2009; Javorcik 2004). Location advantage provides an explanation on where the ownership advantages can be best exploited (Dunning 1993) and most often is the decisive factor on the country selection process. It includes factors such as host country's wage rate, material prices, access to consumers, market size, governmental regulation (such as taxation policies etc.), exchange rates, capital flows, financial development, institutional quality and other (Bevan and Estrin 2004).

Much research has been done on the effect of the aforementioned factors (ownership, location and internalization advantage) on FDI flows however a complete specification of which variables are to be included when statistical investigation is performed has not been standardised (Blonigen 2005;

ownership is necessary for an investment to qualify as a foreign direct investment. (OECD 2018).

Faeth2009). Nevertheless the majority of research on the determinants of FDI focuses and examines the effect of location factors on FDI flows.

Because the focus of this thesis is on the IP systems in force in the host country the next section only provides a brief review of the rest FDI determinants literature (for a complete review see Blonigen 2005; Faeth 2009; Chakrabari 2001).

2.3.1. Foreign direct investment determinants

The most commonly used variables to explain FDI flows are the following. Market size is by far the single most widely used determinant of FDI flows. The basic hypothesis states that a larger market size offers more opportunities for growth and profit and thus attracts more FDI (Blonigen 2005; Chakrabari 2001; Faeth 2009). Indicatively, Swedenborg, (1979), Kravis and Linsey, (1982), Schneider and Frey, (1985) and Shams Uddin, (1994) support the above hypothesis. Exchange rate is also a very common variable with researchers arguing that the weaker the currency of a country the less likely that foreign firms will invest due to profitability risks (Blonigen 1997; Blonigen and Feenstra 1996; Caves 1988; Froot and Stein 1991). Trade barriers and trade openness is often a strong FDI determinant as it is argued that inward FDI is a common substitute of imports of host countries from the home country with high trade barriers or minimum trade openness (Blonigen 1997; Blonigen and Feenstra 1996). Indeed, empirical evidence suggests that FDI leads to a decline of exports in the home country (Head and Ries 2001; Swenson 2004). Wage rate is another influential factor with the most popular hypothesis supporting that countries with low wage rates tend to attract significant more FDI (Flamm 1984;

Saunders 1982). Economic growth of the host country also plays an important role as it suggests that a growing economy provides relatively more and better opportunities for firms to expand their market and make profits (Billington 1999; Culem 1988; Schneider and Frey 1985). Taxation is also one of variables used in existing studies with the researchers arguing that more corporate taxes deter FDI flows (Hartman 1984; Hines and Rice 1994; Kemsley 1998; Loree and Guisinger 1995).

Lastly, the quality of institutions is considered to be another important factor as weak institutions decrease the legal protection of assets, increase the chance of expropriation of foreign firms' ownership advantage, raise transaction costs for foreign firms and thus make the host country less attractive (Blonigen 2005). Estimating the magnitude of the effect of institutions on FDI flows has been difficult because to date there is no effective measurement to approximate institutions as a whole (Blonigen 2005; Walsh and Yo 2010). For this reason, researchers in their majority approximate institutions using, for example, the country's level of corruption by employing the commonly accepted corruption perception index developed by Transparency International. The few empirical evidence by Wei (2000a,b) and Hines (1995) suggests a negative relationship between high levels of corruption and FDI flows.

Others instead of approximating institutions as a whole select one aspect of it, the IP system. Empirical evidence on the effect of IP systems on FDI flows mostly reveals a positive relationship (Awokose and Yin 2010; Bascavusoglu and Zuniga 2005; Branstetter et al. 2007; Khan and Samad 2010; Mc Calman 2004; Puttitanum 2002), while a few studies indicate a negative insignificant relationship (Nicholson 2007; Fosfuri 2004). One omission of the

aforementioned studies is that they conceptualize and empirically test the IP system as having one pillar –the IP law protection. Empirically these studies employ the index of patent protection by Ginarte and Park (1997) and Park (2008) to approximate for the strength of the IP systems as a whole (i.e. IP law protection and IP enforcement). This index however does not include a measurement for patent enforcement (Fosfuri 2004; Javorcick 2004; Nichloson 2007; Nunnenkamp and Spatz 2004; Papageorgiadis et al. 2014) as it is only 'designed to provide an indicator of the strength of patent protection and not the quality of patent systems' (Park 2008:761). Therefore, the Ginarte and Park (1997) and Park (2008) indices can be used to proxy for the strength of patent/IP law protection but not the strength of the enforcement dimension. In Chapter 5 this research gap is addressed by conceptualizing and testing for the distinct effect of public IP enforcement on FDI flows.

2.4. Foreign Direct Investment (FDI) spillovers

In order to address **RQ1** and **RQ2** Chapters 3 and 4 investigate the distinct direct and moderating effect of IP law protection and public IP enforcement on FDI horizontal and vertical spillovers (respectively). This section reviews the literature on FDI spillovers and identifies the knowledge gaps this study aims to address.

2.4.1. FDI horizontal spillovers

FDI spillovers refer to the changes in domestic firms' productivity as a result of the foreign presence in the country. FDI spillovers can take the form of horizontal or vertical spillovers. FDI horizontal spillovers occur when the domestic firms engage in competing activities with the foreign affiliates while

both of them operating in the same industry and this interaction brings changes to their productivity (Liu et al. 2009). The most common channels through which FDI horizontal spillovers can take place are; i) the demonstration channel where domestic firms may imitate foreign firms proprietary knowledge ii) the labour turnover channel where domestic firms hire employees trained by the foreign firms and iii) the competition channel where domestic firms use their own capabilities more efficiently to address the severe competition from the foreign firms (Liu et al. 2009).

Nevertheless domestic firms may not always be able to utilize these channels. When domestic and foreign firms compete in the same industry, then the latter have an incentive to prevent knowledge leakage and thus spillovers from taking place. Thereof foreign firms tend to guard their proprietary knowledge via IP, trade secrecy, paying higher wages to prevent labour turnover etc. and obstruct knowledge from diffusing to the domestic firms (Javorcik 2004; Liu et al. 2009). However because the fundamental concept underlying FDI spillovers is the concept of externality FDI horizontal spillovers are still possible. Externality relates to the public good nature of knowledge that is it can be transferred at zero or low marginal cost (Arrow 1962; Magee 1977). This implies that one party can benefit from the use of the common good without paying full cost to the owner or inventor (Kogut and Zander 1993). In the context of FDI horizontal spillovers, although foreign affiliates make effort safeguarding their proprietary knowledge, due to the public good nature of knowledge in most cases it is impossible to avoid some degree of knowledge leakage. By accumulating and exploiting such knowledge, domestic firms may experience an increase in their productivity. As such FDI horizontal spillovers induce positive externality for the

domestic firms and the magnitude of such positive externality is dependent on the specificity, tacitness and complexity of the knowledge possessed by foreign affiliates.

The effect of foreign presence on domestic firms' productivity is a widely researched topic both theoretically and empirically. In terms of FDI horizontal spillovers the empirical literature presents both positive and negative findings. For instance, in the context of developing countries, Chuang and Lin (1999) for Taiwan, Blomstrom and Sjoholm (1999) and Sjoholm (1999) for Indonesia, Aslanoglou (2000) for Turkey, and Zhang et al. (2010) for China, find that inward FDI leads to a positive change in the domestic firms' productivity. However, Haddad and Harrison (1993) for Morocco, Aitken and Harrison (1999) for Venezuela, and Djankov and Hockman (2000) for Czech Republic, report the opposite results. Research on developed countries also reports mixed findings. Examples of finding positive spillovers to name but a few include Haskel et al., (2007) and Liu et al. (2000) for UK, Keller and Yeaple(2009) for USA, and Barrios et al.(2004) for Greece, Ireland and Spain who report positive FDI spillovers. Examples of findings that indicate negative spillovers include Barrios and Strobl (2002) for Spain, and Driffield (2004) for UK.

2.4.2. FDI vertical spillovers

FDI vertical spillovers occur when domestic firms and foreign affiliates operate in different industries and are divided into backward and forward linkage spillovers (Liu et al. 2009). FDI backward spillovers arise when domestic firms supply the foreign affiliates with goods and services from the upstream industries (Liu et al. 2009). The major channels for FDI backward spillovers to

occur are two. First, the direct knowledge transfer from foreign affiliates to domestic suppliers. Because foreign affiliates have incentive to transfer their advanced practices and knowledge they tend to educate their suppliers by i) providing technical assistance to raise the quality of the products/services, ii) offering advices and know-how that upgrade their production processes and stimulate innovation, and iii) helping with management training (Driffield et al. 2002; Javorcik 2004; Blalock and Gertler 2007). Second, the arrival of foreign affiliates in the host country increases the demand for intermediate goods hence the competition among domestic suppliers. Due to the fact that foreign affiliates quality and delivery standards are high, domestic suppliers are motivated to upgrade their practices in order to win contracts with the foreign affiliates leading at the end in increasing their overall performance and productivity (Blalock and Simon 2009; Javorcik 2004). In return for the knowledge transfer, foreign affiliates benefit from the improved services and products developed and offered by the domestic firms (Javorcik 2004).

FDI forward spillovers arise when foreign affiliates sell goods and services to the domestic firms (Liu et al. 2009). FDI forward spillovers may take place via two channels. First, it is generally accepted that foreign affiliates are more innovative than domestic firms as they most often possess advanced technological and managerial know-how (Smeets and de Vaal 2016). As such domestic buyers by interacting/ co-operating with the foreign affiliates are exposed to superior quality inputs and new practices which if they adopt and utilize can improve their sales and overall performance (Driffield et al. 2002). Second, as foreign affiliates are more innovative than domestic firms and can offer higher quality products, intensify competition in the industry and is likely to

crowd out some of the domestic competitors (competition effect see Aitken and Harrison 1999). Therefore many domestic firms may end up buying their inputs from the foreign affiliates (Smeets and de Vaal 2015). As foreign affiliates can utilize the advantages of economies of scale may offer their products at lower prices. Domestic buyers by purchasing inputs at lower prices than before may increase their profitability or may allocate their monetary surplus in innovative activities that could potentially increase their productivity and performance (Smeets and de Vaal 2015).

Empirical evidence on FDI vertical spillovers in their majority shows that the foreign presence has a positive effect on the productivity of domestic suppliers and buyers or at least an insignificant effect. For example, Driffield et al. (2002) and Fu (2012) for UK and Du et al. (2012) for China, find evidence for positive FDI forward spillovers while Laenarts and Merlevede (2011) for Romania and Xu and Sheng (2012) for China find insignificant effect of foreign presence. Regarding FDI backward spillovers, Blalock and Gertler (2003), for Indonesia, Kugler (2001) for Colombia, Javorcik (2004), for Lithuania and Du et al. (2012) for China find evidence ofpositive FDI backward spillovers while Laenarts and Merlevede (2011) for Romania and Xu and Sheng (2012) for China report insignificant effect of foreign presence. Such findings are consistent with the theoretical expectation: in the absence of competition effect, as in the case of FDI vertical spillovers, the presence of foreign affiliates in upstream and downstream industries is likely to have a positive effect on domestic suppliers and buyers' productivity.

Despite the importance of the host country's IP system in IB research (Arora 2009; Maskus 2000; Peng et al. 2017a) only but a few studies control for the

effect of IP systems in FDI spillovers (Irsova and Havranek 2013; Havranek and Irsova 2011; Smeets and de Vaal 2015). However existing studies theorize that both the availability of IP law protection and the effectiveness of public IP enforcement have a uniform effect on FDI spillovers. However as pointed out by the WTO, countries may offer a strong IP law protection framework but may not always enforce it in practice (Peng et al. 2017a and b).Moreover these studies by employing the Park (2008) patent protection index captures the effect of IP law protection on FDI spillovers but do not take into consideration the effectiveness of the public IP enforcement element. In Chapters 3 and 4 two research gaps in the existing literature are addressed: the direct distinct effect of public IP enforcement on FDI spillovers and the moderating role of the public IP enforcement on the relationship between the strength of IP law protection and FDI spillovers.

CHAPTER 3

PUBLIC IP ENFORCEMENT AND THE EFFECT ON FDI HORIZONTAL SPILLOVERS

3.1. Introduction

This chapter investigates the role of national Intellectual Property (IP) systems and particularly the effectiveness of public IP enforcement (e.g. customs, judiciary) in stimulating horizontal productivity spillovers from Foreign Direct Investment (FDI).

The strength of a host country's IP system can determine the level of IP risk that Multinational Enterprises (MNEs) face when investing in the country and an MNE's decision to engage (or not) in the transfer of technological assets to a local subsidiary, invest in R&D activities, and license its IP to domestic companies (Branstetter et al. 2007; de Faria and Sofka 2010; Javorcik 2004). MNEs strive to avoid having their IP infringed in a host country since this can enable the domestic competitors to upgrade their capabilities while avoiding heavy investments in R&D (Capelli et al. 2014; Liang 2017). MNEs therefore transfer more high value technological IP assets in countries where they expect them to be protected. An MNE's decision to undertake high value activities in a host country can help domestic firms improve their productivity since it provides opportunities for domestic firms to access the technological IP assets of the MNE legally, via observation and imitation or illegally by gaining access to the MNE's leaked technological innovations (Berry 2017; Pavlinek and Zizalova 2014). The strength of the IP system of a host country is generally expected to

determine the extent to which domestic firms can illegally or legally access and exploit the IP assets of MNEs and the degree to which MNEs can efficiently appropriate the economic returns from their innovations (de Faria and Sofka 2010; Teece 1986; Zhao 2006).

The strength ofIP systems depend on two distinct elements of a country's institutional environment: the availability of IP protection, and the effectiveness of public IP enforcement (Peng et al. 2017a). IP protection relates to the availability of IP laws that assign exclusive temporary monopoly rights to innovators and define the legislative mechanisms (e.g. legal procedures) that can enable IP owners to appropriate and protect their rights in a country (de Faria and Sofka 2010; Maskus 2004). The availability of comprehensive IP law protection in a host country is important for MNEs, as it enables them to register and commercialise their IP assets under its legal system. It also provides the legal mechanisms available for use by public IP enforcement agents, if an MNE seeks to exercise itsIP rights in case of infringement or other opportunistic behaviour. IP enforcement relates to the application of IP law protection and legal mechanisms in practice, by public enforcement agents such as the judiciary and customs (Papageorgiadis et al. 2014; WIPO 2014).However, while the onus of seeking to enforce IP is on the private IP owner, the successful pursuit of a litigation case depends on the effectiveness of public IP enforcement agents whose perspectives and actions may not meet the *spirit* of the expectations set by the letter of the IP law in a country (Peng et al. 2017b).[9]

[9] The importance of the public enforcement element of contemporary IP systems is highlighted by the World Intellectual Property Organization (WIPO 2004:207) which suggests that: '…there is no point in establishing a detailed and comprehensive system for protecting IP and disseminating information concerning them, if it is not possible for the right-owners to enforce

This is because although the availability of comprehensive IP law protection is necessary in a country, 'the real issue is whether a country adequately enforces the laws and regulations it has in place' (Maskus 2004:22).Therefore, when studying the effects of IP systems on economic activity, it is important to consider the effects of both elements of IP systems.

Extant studies on the effect of national IP systems on FDI horizontal productivity spillovers however, focus solely on the availability of the IP law protection element when studying the effects of IP systems (Arora 2009). Such studies found either a positive (Yi et al. 2015), negative (Irsova and Havranek 2013) or insignificant (Smeets and de Vaal 2016) effect on FDI horizontal productivity spillovers. Those studies ignoring the effect of public IP enforcement are likely to be biased. This is because focusing on only one element of IP systems in their modelling, those studies de facto assumed that both the availability of IP law protection and the effectiveness of public IP enforcement, have developed equally over time and have a uniform effect on FDI productivity spillovers. Evidently, both Irsova and Havranek, (2013) and Smeets and de Vaal, (2016) only considered the *de jure* IP protection without recognising the difference and interaction between the two elements of IP systems.

Conversely, the actual contemporary context of IP systems internationally after the signing of the Trade-Related Aspects of Intellectual Property Rights (TRIPs)agreement in 1995is substantially different to what it is theorised in the existing literature. Although most countries have significantly increased the availability of IP law protection in their IP systems after TRIPs, the effectiveness

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their rights effectively in a world where expanding technologies have facilitated infringement of protected rights to a hitherto unprecedented extent'.

with which the IP laws and legal mechanisms are enforced in practice by public authorities, continues to be questionable for many countries (Peng et al. 2017a 2017b). This is because although the TRIPs agreement requires signatory countries to provide a number of specific legislative procedures in relation to enforcement mechanisms, it does not set out any obligations/requirements regarding how effectively IP law protection is applied in practice by public enforcement agents (WTO 2017).[10] Therefore, while most WTO countries nowadays offer IP law protection that is generally comprehensive (Park 2008; Peng et al. 2017a), the levels of effectiveness of public IP enforcement continue to vary significantly between countries (Brander et al. 2017; Papageorgiadis et al. 2014).

This chapter intends to make two contributions to the literature. First, it integrates in the established theoretical and empirical frameworks the distinct effect of the public IP enforcement element of IP institutions on horizontal FDI productivity spillovers. The incorporation of the public enforcement element of IP systems allows for the identification of a new IP institutional mechanism affecting FDI horizontal productivity spillovers, which the previous literature ignored or assumed to be identical with the strength of IP law protection. The finding from this approach indicates that the strength of public IP enforcement in a country has a significant positive effect on FDI horizontal productivity spillovers. This challenges the findings of existing studies (Yi et al. 2015; Irsova and Havranek 2013; Smeets and de Vaal 2016) and highlights the importance

[10] According to the WTO (2017): 'the provisions on enforcement do not create any obligation to put in place a judicial system for the enforcement of intellectual property rights distinct from that for the enforcement of law in general, nor does it affect the capacity of Members to enforce their law in general. In addition, it is stated that nothing in these provisions creates any obligation with respect to the distribution of resources as between enforcement of intellectual property rights and the enforcement of law in general'.

of incorporating the strength of public IP enforcement in analysing the effect of IP systems on international business and other phenomena. The first contribution also enables this chapter to theorise on the potential of an interacting effect of the strength of public IP enforcement on the relationship between the strength of IP law protection and FDI horizontal productivity spillovers.

This leads to the second contribution of this chapter, where the moderating role of public IP enforcement strength on the effect of the strength of IP law protection on FDI horizontal productivity spillovers is examined. Bridging the insights from IP systems and FDI spillovers literature, this chapter posits that the effectiveness of IP enforcement has a negative moderating effect on the relationship between IP law protection and FDI horizontal spillovers**.** That is, in countries where both IP law protection is high and public IP enforcement are strong, the domestic firms will experience less horizontal productivity spillovers, because foreign firms are able to exercise market power and stifle the competition from domestic firms (e.g. Fisher III and Oberholzer-Gee 2013).This is an important point since this theoretical reasoning provides a reconciling explanation for the diverging empirical findings of the existing studies, which only considered the strength of IP law protection to approximate for the overall effect of IP systems. The finding of a moderating effect of strong public IP enforcement, suggests that the diverging findings of the previous literature probably relate to the uncaptured (both direct and moderating) effect of the second element of IP systems. Importantly, the direction of moderating effect is different compared to the distinct direct effects of both IP elements. Identifying this moderating role of the public IP enforcement on the effect of the strength of

IP law protection, has important implications for future studies on the influence of IP systems on international business. Future studies on the effect of IP systems should go beyond the current standard approach of solely focusing on the strength of IP law protection by considering both the distinct direct and moderating effect of the public IP enforcement element of IP systems.

3.2. Background to IP systems

IP systems are comprised of two distinct elements: a) IP protection, and b) public IP enforcement (Khoury et al. 2014; Peng et al. 2017a). The IP protection element relates to the availability of IP law as it appears in the statutes of a country's legislative framework. The range of IP law availability in a country determines which intellectual assets can receive IP protection, the duration of IP protection (e.g. typically 20 years for patents), and the legal sanctions that can be used by IP enforcement agents (OECD 2014). For example, IP law in a country determines the level and range of fines exacted on IP infringers convicted of IP violations. Countries offering strong IP protection generally provide legislative frameworks that offer IP protection coverage to a wide type of IP assets and a broad number of legal enforcement mechanisms for use by the IP enforcement agents (Ginarte and Park 1997). In contrast, in weak IP law protection countries, protection may not be available for a range of IPs that receive protection in other countries. This is because there are differences in the availability and range of IP law protection between countries internationally, such as country specific legal exemptions or lack of IP law availability for specific IP assets (for instance in the patentability of a software or the duration of a copyrights) (Park 2008).Therefore, while IP owners may be awarded IP protection in one country, they may not be able to register and protect their

rights in another country. In addition, the available laws related to the enforcement of IP may not provide a range of legal options to IP enforcement agents to carry out their operations effectively. This can relate to the potential lack of legislation that allows IP enforcement agents to award and enforce preliminary injunctions for IP cases.

The way that law is enforced (or not) in practice is distinct from the existence of law on the books, since enforcement depends on the behaviour of public agents (Dixit 2009). While IP law in a country is codified and evidenced in writing in the legislative books of an IP system, it is subject to the interpretation of the judiciary and other public IP enforcement agents such as customs, police and trading standards (Khoury et al. 2014). This is because the application of IP law in practice is at the discretion of IP enforcement agents (Khoury et al. 2014). The extent to which the public IP enforcement agents will effectively engage and enforce IPRs will depend on their views and perceptions about IP infringement. For example, if they perceive an activity as illegitimate or not. Similarly, even if the IP legislative framework in a host country includes laws that enable punitive sanctions to IP infringers, these may never be utilised by the judiciary or enforced in practice by the customs officials. Therefore the same IP laws available in two different countries may be applied differently depending on the way that the IP law is decoded and interpreted by the IP enforcement agents of the country (e.g. punitively in one country and non-punitively in another). Therefore, strong public IP enforcement levels in a country are likely to emerge in practice when public IP enforcement agents effectively prosecute IP infringement and the judiciary apply IP law independently and transparently (Pajunen 2008). In contrast, weak public IP enforcement can arise when

opaque, arbitrary and ineffective judiciary and enforcement authorities may be receptive to corrupt practices and fail to effectively enforce the IP laws in practice (Butterton 1996, Maskus 2004).

Distinguishing between the strength of IP law protection and the strength of public IP enforcement in a country is particularly important in the years after the implementation of the TRIPs agreement.[11] The TRIPs agreement entered into force in 1995 and set the minimum standards for IP law protection among the member countries of the WTO (WTO 2017). The implementation of the TRIPs agreement brought a significant change to IP law protection in the legislative framework of WTO member countries. The TRIPs agreement however did not set obligations for WTO countries regarding the effectiveness with which IP law is enforced by public enforcement agents (Maskus 2015). The introduction of TRIPs and the compliance to a specific IP legislative framework, may have introduced IP laws that did not align with the dominant norms in a country but was imposed as a result of external political pressure through a multilateral negotiation process (Brander et al. 2017). While many WTO signatory countries now have legislative frameworks that offer a wide range of IP legislation, there is a mismatch between the new TRIPs required IP laws and the dominant norms towards IP in a country. This mismatch leads to the ineffective enforcement of the law by public IP enforcement agents in practice. This is the case for countries like China, where its IP law protection framework is generally

[11] Developed countries were required to incorporate the TRIPs required changes in their legislative framework within one year (1996), while developing countries were required to implement them within a 5 year period (January 1 2000). This is mainly because many of the developing countries had very limited (or in some cases non-existent) IP legal frameworks. Developing countries were subsequently offered an extension of this deadline to 2006, which was further extended for least developed countries only to the year 2013 and eventually to the 1st of July 2021 (WTO 2017).

considered to be well crafted, but the actual enforcement of IPRs by public agents in the country is weak (Peng et al. 2017b). The mismatch has become particularly evident in the years after TRIPs, when a gap between the strength of IP protection and the effectiveness of public IP enforcement emerged in many WTO countries (Jadhyala 2013).

3.3. Hypothesis development

3.3.1. FDI Horizontal spillovers and MNC responses

FDI activity in a host country is generally expected to generate horizontal knowledge spillovers that will benefit the performance of local firms operating in the same industry (Javorcik and Spatareanu 2008). One of the reasons that enable MNEs to engage in FDI and compete in a foreign market is their capability to access, develop, transfer, and exploit advanced knowledge assets such as IP (Almeida and Phene 2004). MNEs pool such IP assets from their innovation activities at home and abroad (Chang et al. 2012; Gupta and Govindarajan 2000; Lee et al. 2008) and use them as the spearheads for successfully entering and competing in new host countries internationally. The transfer of advanced IP and other knowledge assets, to their foreign affiliate entities, enables MNEs to overcome the liability of foreignness in the host country through the exploitation of IP assets that are more advanced than those of domestic firms. The transfer of MNE knowledge and IP in a host country in the form of intangible assets such as patents, trademarks, and know-how however, can allow domestic firms to benefit from the potential knowledge leakage attached to these assets of foreign firms and help them to enhance their productivity and competitiveness. Due to the public good nature of

knowledge, once it is accessed, it can be transferred at zero or low marginal cost to more recipients. Accessing advanced IP and know-how can, therefore, enable domestic firms to benefit from the use of an MNE's knowledge and avoid the monetary liabilities to the legal owners of the IP (Arrow 1962; Kogut and Zander 1993; Magee 1977).

Knowledge spillovers from the FDI of MNEs in a host market can occur directly, in terms of knowledge that is leaked from the MNE, or indirectly through the exposure of the domestic firms to the products and practices of the MNE. Knowledge can directly diffuse in a host country through employee mobility, when employees of the MNE in the host country move on to work for domestic firms (Berry 2017). This process allows the domestic firms to directly access the IP and know-how of the MNE and utilise it to improve their own practices and competitive offering (Aitken and Harrison 1999; Gorg and Strobl 2001). Domestic firms can also experience direct productivity spillovers by licensing the IP assets of the MNEs or by entering in joint venture agreements with them. There are two main indirect channels with from which domestic firms benefit accessing the IP, knowledge and know-how of MNEs: a) the demonstration channel, and b) the competition channel (Gorg and Greenaway 2003; Liu et al. 2009; Yi et al. 2015). The demonstration channel relates to domestic firms reverse engineering innovative products and their attempts to imitate the proprietary technology of foreign MNE affiliates (Gorg and Greenaway 2003; Meyer and Sinani 2005).The competition channel relates to the presence of MNEs in a host country, which leads to the intensification of the competition in the industry through the higher number of competitors and by introducing new ways of competing (Meyer and Sinani 2009). This helps domestic firms to

increase their productivity by attempting to reduce their inefficiency and/or increase investment in R&D and knowledge generation/acquisition. A domestic firm's investment in R&D can also aim to invent around and develop similar (legally registered or unregistered) IP assets to those of the MNE, while avoiding the legal infringement of the MNE's IP assets. In addition, domestic firms can seek to gain a license of the MNEs' advanced technology in exchange for a licensing fee and annual royalties. Licensing can allow a domestic firm to increase their productivity by legally accessing IP assets while also benefitting the MNE. The extent to which domestic firms can increase their productivity will depend on their capability to absorb and reconfigure advanced knowledge and know-how (Cantwell 2017; Cohen and Levinthal 1990; Escribano et al. 2009).

MNEs pursue two different approaches to safeguard against the leakage of their proprietary knowledge and reduce the unintended spillovers from the unauthorised exploitation of their IP by domestic firms. The first approach relates to the development of internal mechanisms in the MNE subsidiary to control the extent of IP and know-how leakage (de Faria and Sofka 2010). Further to registering the IP assets in the host country, such internal mechanisms can include secrecy measures within the subsidiary and the use of complex designs that limit the usability of the IP and knowledge, unless it is combined with other know-how and expertise held outside the subsidiary (de Faria and Sofka 2010). In addition, to retain a tighter grip on the potential unintended leakage of parent firm knowledge, MNEs often employ a large number of expatriate managers in the host country to implement IP control policies by monitoring and managing the use of IP within the subsidiary (Berry 2017).

The second approach relates to MNEs' attempts to limit the unintended spillovers once their proprietary IP knowledge is found to be used by domestic firms, either through direct leakage or through the demonstration and competition effects. In the process of identifying and fighting again IP infringement, MNEs need to engage with the public enforcement agents of the host country who are responsible for enforcing IP law in practice such as the judiciary, the police and customs agents (Bessen and Meurer 2008; Yanget al. 2008). The effectiveness of the public enforcement agents can determine the extent to which a suspected IP infringement case in a host country (as identified by the MNE or by the public enforcement agents) will be prosecuted, and the extent to which the judiciary will apply IP law in a timely, non-discriminatory, and effective manner to penalise domestic IP infringing firms (Ahammad et al.. 2017). In countries where the firms can effectively engage with public IP enforcement agents and stop or punitively penalise IP infringement cases, the MNEs will be able to successfully limit the unintended spillovers from unauthorised IP exploitation, even if the proprietary IP and know-how of the MNE has leaked to domestic companies.

While the effectiveness with which public IP enforcement agents enforce IP law in a host country can determine the extent to which domestic firms in the same industry benefit from spillovers, this element of the institutional fabric of host countries has not received much scholarly attention in the FDI horizontal spillovers literature to date. Over the past few years, a large number of studies have focused on different host country and firm characteristics and examined their influence on the knowledge transfer, diffusion and FDI horizontal spillovers to domestic firms in a host country (Aitken and Harrison 1999; Audretsch and

Feldman 1996; Blomstrom and Sjoholm 1999; Brouthers 2002; Chuang and Lin 1999; Dimelis and Louri 2002; Kinoshita 2001; Meyer and Sinani 2009; Sjöholm 1999). However, there has been little interest in the role of the effectiveness of IP systems in generating FDI horizontal spillovers (Arora 2009).Existing studies in the area limited their focus on the role of the strength of IP law in a host country in stimulating or discouraging horizontal FDI spillovers and found mixed results (Havranek and Irsova 2011; Irsova and Havranek 2013; Smeets and de Vaal 2011; Yi et al. 2015).These studies assumed that the effectiveness of public IP enforcement was equal (in strength) to the strength of IP law protection. Existing research therefore focused on one of the two elements of IP: the strength of IP law as it appears in the legislative framework of a country, but they did not study the role of the effectiveness of public IP enforcement agents, nor the way that public IP enforcement moderates the effect that the strength of IP law has on FDI horizontal spillovers. The key theoretical lenses used in order to put together the following hypotheses are transaction cost theory and institutional theory.

3.3.2. IP law protection and FDI horizontal spillovers

Building on the three stage model introduced in Chapter 1 and the institutional and transaction cost theories, this section presents the following hypotheses.

Due to the incompleteness of all contracts, formal institutions such as the level of IP law protection in a given country is important for MNEs, as they condition the norms of behaviour by defining the boundaries of what is legitimate or not (North 1992). In this case, the IP law protection framework allows (or not) MNEs to be grant and register heir IP in the host country, which in most cases

happens to be their ownership advantage. As such, strong formal institutions decrease MNEs' external uncertainty enabling them to transfer their IP assets and advanced technological and managerial know-how to their foreign affiliates (Branstetter 2006; Wakasugi and Ito 2009; Yi et al. 2015). In particular, Branstetter (2006) examined the effects of IP law protection on technology transfer from U.S parent firms to their foreign affiliates for the period 1982–1999 in 12 countries and found a significant increase in the royalty fee when IP law protection is strong in the host countries. Along the same lines Wakasugi and Ito's (2009) study of Japanese MNEs' foreign affiliates in 33 countries, based on firm-level panel data for the years 1995 and 2001, showed that strong IP law protection has a positive effect on the transfer of advanced technology from the parent firms to their foreign affiliates. Since MNEs are institutional outsiders when entering a host country, they are expected to face high information costs due to their unfamiliarity with the local institutional environment and practices (Hennart 2012; Khoury et al. 2014). When MNEs find familiar aspects in the IP systems of a host country such as the strength of IP law, they perceive it as a positive signal that can enable them to register, legally protect, and potentially enforce their legal rights against IP infringement (Khoury et al. 2014). This is especially the case in host countries with strong location advantages (e.g. large market size, low cost or highly skilled labour) where accessing and benefiting from these advantages may be considered to be a priority for the overall success of the MNE. Therefore, when IP law is strong in a host country, MNEs consider it as a positive signal indicating that they could access the location advantages of the country, while they also exercise and safeguard their IP assets. Moreover, MNEs are positively influenced by increases in the availability

of IP law in a host country and respond by increasing their patenting activity there (Khoury et al. 2014). The increase in patenting activity by MNEs in a host country with strong IP law protection (Khoury et al. 2014), is expected to increase the amount and quality of IP assets and know-how transferred to the MNE's subsidiaries (Berry 2017). As such, host countries with strong IP law protection offer incentives to IP dependent MNEs to register and develop innovative IP in the host country.

Higher levels of FDI are also expected to boost the quality and quantity of technology transferred to the host country in the form of IP assets and know-how, generating positive spillovers to the domestic firms. Domestic firms utilising the spillover channels can directly (labour mobility channel) or indirectly (demonstration and competition channel) access the IP of foreign firms. This is the case even if the subsidiaries of MNEs utilise internal mechanisms aimed to limit knowledge leakage. Although the strength of IP law enables the MNEs to position their IP assets in the technological landscape of legally protected IP, domestic firms can still illegally access the know-how of foreign firms through IP infringement. Regarding the imitation channel Zhao (2006) states that imitation has three preconditions: i) the motivation to imitate, ii) the ability to imitate, and iii) the legal restrictions against imitation. In respect to motivation, because imitation is a costly process it will only take place when imitators (in this case domestic firms) expect to profit from it and, as the literature has established, advanced IP can offer IP owners a competitive advantage. Thus domestic firms driven by opportunistic behaviour may attempt to illegally acquire MNEs' IP. Zhao's (2006) third precondition for imitation is the legal restrictions against imitation. Strong IP law protection in the host country minimises some of the

positive externalities of the public good nature of knowledge by imposing statutes on what constitutes illegal imitation. However, the strength of IP law in a country does not automatically constrain IP infringement activities (Bessen and Meurer 2008; Brander et al. 2017).To stop IP infringement, MNEs need to become aware of their IP infringement by competing firms, engage with the public IP enforcement agents by attempting to gain their support, and rely on them to stop and penalise the infringers. In other words, strong IP law protection without effective enforcement of these laws still allows domestic firms to access and imitate MNEs' IP.

Whether or not domestic firms can fully benefit from the MNEs' leaked knowledge relates to Zhao's (2006) second precondition for imitation i.e. the ability of domestic firms to imitate or, as usually stated in the spillover literature, domestic firms' absorptive capacity. Strong IP law protection is said to offer an incentive to domestic firms to develop their own innovative IP by engaging in R&D activities to ensure that their IPR will be granted. Engaging in R&D allows domestic firms to further build their innovative capabilities and enhance their absorptive capacity and potentially increase their ability to engage with MNE knowledge/IP (Chen and Puttitanun 2005; Yi et al. 2015).

Therefore, it can be expected that strong IP law protection:(i) enables foreign MNE affiliates to transfer and register their IPs in a host country, (ii) does not restrict the leakage of MNEs' knowledge via the spillover channels; and (iii) assists domestic firms to build their absorptive capacity, which is necessary if they aim to absorb and incorporate MNEs' knowledge into their own practices.

Hypothesis 1: *The strength of IP law protection in a country positively affects the FDI horizontal productivity spillovers.*

3.3.3. Public IP enforcement and FDI horizontal spillovers

The enforcement of IP laws is a two dimensional concept involving the institutional capacity together with the institutional will to enforce laws (Ostergard 2000:358). The former relates to the enforcement agents needed to enforce the law (Ostergard 2000; Papageorgiadis et al. 2014), and the latter relates to the behavioural component of institutions (informal institutions) (Ostergard 2000). The ability of an MNE to effectively defend its IPs that it registers and transfers to a host country against IP infringement, will depend on the effectiveness of public IP enforcement agents (capacity and behavioural attitude). After transferring and actively engaging in the internal or external exploitation of their IP assets, MNEs actively monitor the IP landscape of a host country to identify the potential infringement of their rights (Oxley 1999). In the best case scenario, when a competitor infringes the IP assets of the MNE, the firm will engage with the public IP enforcement agents of the host country and aim to seize and halt the activities of the infringing party (Yang et al. 2008). The MNE can also aim for a preliminary injunction by taking the case to the judiciary through IP litigation, as well as engage with other public IP enforcement agents to enforce potential legal actions against the infringing parties and stop them from continuing their illegal activities (Keupp et al. 2010). In this case it is implied that the host country has the capacity to enforce the IP laws and the enforcement of such laws is undertaken effectively irrespective of the enforcement agents' ideology (North 1991 1992). In other words the enforcement agents are toa substantial degree impartial in their judgements and

their personal ideological constrains do not obstruct justice (North 1987). In countries where public IP enforcement is strong, MNEs can expect that the enforcement agents will effectively deter the IP infringement activities and that the IP infringers will be effectively prosecuted through the imposition of punitive sanctions and penalties (Papageorgiadis et al. 2014). The delivery of such sanctions and the effective enforcement of IP by the enforcement agents can act as a deterrent for IP infringing activities, discouraging the opportunistic behaviour of domestic firms who might consider infringing the IP of an MNE but eventually refraining from doing so due to the high risk of being prosecuted and penalised. Following Zhao's (2006) precondition for imitation, it can be argued that strong public IP enforcement decreases the motivation of domestic firms to imitate as well reinforces the legal restrictions on imitation. As such, this makes the host country more attractive allowing MNEs to register, transfer, develop and enforce IPR.

In contrast, in countries where public IP enforcement is weak, even if an MNE pursues a litigation case against infringers, the firm will find it difficult and problematic to effectively enforce its rights in practice (Yang et al. 2008). This is because enforcement agents' ideologies towards fairness and justice may be relatively relaxed or their behavioural attitudes may not condemn illegal activities. For instance, the judiciary may delay the delivery of a judgement on an IP case and if the defendant is found guilty, may award limited penalties and damages that are not punitive and have a limited effect on the operations of the infringer (Brander et al. 2017). Furthermore, other public IP enforcement agents, may not actively enforce the judiciary's rulings or do so ineffectively, allowing the IP infringers to continue operating in the country. Ineffective public

IP enforcement will not deter the infringing firms from continuing to engage in similar activities in the future. Thus, weak public IP enforcement does not reduce infringers' (in this case domestic firms) motivation to imitate and does not reinforce the legal restrictions on imitation. In such cases, MNEs' contracting, monitoring and enforcement costs will rise. This is because they cannot rely on common perceptions of fairness (since they differ from country to country) to write and enforce contractual agreements (North 1992). As a consequence MNEs may not transfer nor register their IP in the host country.

Strong public IP enforcement is also expected to limit MNEs' knowledge leakages via the spillover channels. For instance, MNEs can limit the direct knowledge spillovers from former MNE employees transferring the newly acquired knowledge to a domestic firm, and also reduce the indirect spillovers from the demonstration channel (Agarwal et al. 2009).[12] While strong public IP enforcement can curb the potential positive FDI productivity spillovers to domestic firms from the illegal channels, it is expected to boost the positive spillovers through the legal direct and indirect channels. With regards to the direct channels, strong public IP enforcement levels can allow MNEs to confidently and efficiently utilise and monetise higher value IP assets in external markets, through the licensing of their IP assets to non-affiliate firms and the formation of joint-ventures with domestic firms (Branstetter et al. 2006; Chen 2013; Ivus et al. 2017; Leahy and Naghavi 2010). Stronger levels of IP enforcement can lower the scope of illegal imitation and potential breach of

[12] According to Agarwal et al., (2009:1353) 'employees who leave to join or establish other companies may not have legal rights to make, use, or build upon patented technologies owned by their former employers unless explicit permission to do so has been granted through license agreements'. For more information on labour mobility and patent enforcement see Agarwal et al., (2009).

contractual agreements by competitors and contractual partners, providing confidence to the IP owning MNEs that their rights will be effectively defended in case of infringement (Arora and Ceccagnoli 2006; Oxley 1998). Therefore, domestic firms collaborating with MNEs can increase their productivity by legally accessing the IP assets and advanced technological and managerial know-how of the MNEs through licensing and establishing joint ventures, leading to positive FDI horizontal productivity spillovers (Chen 2013; Javorcik 2004; Javorcik and Spatareanu 2008). The legal indirect channels to positive FDI productivity spillovers for domestic firms in countries where public IP enforcement is strong, occur through the competition effect. The exploitation of high value IP assets by MNEs in a host country can offer them a competitive advantage against their domestic competitors in terms of cost (lower costs) and differentiation (advanced products).This can apply strong competitive pressure to the domestic firms who need to react and adapt their strategy in order not to be marginalised. Strong public IP enforcement conditions in a country offer an incentive to domestic firms to develop their innovative capabilities by engaging in R&D activities, which can allow them to enhance their absorptive capacity (Chen and Puttitanun 2005; Yi et al. 2015). Domestic firms can continue to reverse engineer the more advanced technological assets of MNEs, but are expected to engage in more complex innovation activities since they need to manoeuvre around the technological landscape and avoid infringing the IP of MNEs (Maskus 2005). As a result of the increased competition from the MNEs, domestic firms can upgrade their capabilities and IP assets and improve their productivity. Overall, domestic competitor firms will benefit from accessing the

advanced IP of MNEs through the legal direct and indirect channels and improve their productivity.

Hypothesis 2: *The strength of public IP enforcement in a country positively affects the FDI horizontal productivity spillovers.*

3.3.4. The role of IP enforcement on the relationship between IP law protection and FDI horizontal spillovers

A limiting factor affecting the FDI horizontal productivity spillovers to domestic firms can emerge in countries where MNEs have access to strong IP law protection and where the law is strongly enforced by public IP enforcement agents. Although the two elements of IP systems individually are expected to have a positive impact on the direct and indirect channels of FDI horizontal spillovers, strong enforcement of IP rights supported by strong IP law protection has the potential to block the spillover channels and thus the diffusion and absorption of MNEs knowledge. In terms of the competition channel, strong IP law protection and public IP enforcement provide strong market power to a MNE which affects the industry dynamics in a host country. This is because MNEs can gain a dominant, near monopolistic position in the host market by transferring their entire IP portfolios and seeking to appropriate it by blocking competition (Allred and Park 2007; Maskus 2000:87; Smeets and de Vaal 2016). For example, an MNE that holds a number of interlocking patents protecting the development of a technological product can confidently seek to halt the exploitation of similar substitute products by domestic competitors, in the anticipation that the strong public IP enforcement will support its strategy (Grimpe and Hussinger 2013). This specific type of favourable IP appropriate

conditions, would not have been possible in other IP systems where IP law protection is strong, but public IP enforcement is medium or low (and vice versa). The strong market power of MNEs that exploit their IP internally, is expected to attract market demand away from domestic firms leading to a crowd out effect, and a decline in their profitability and productivity (Aitken and Harrison 1999; Smeets and de Vaal 2016). The monopolistic position of the MNEs resulting from the accumulated IP and its strong protection and enforcement, can limit the ability of domestic firms to respond to competitive pressures by investing in research and development, or finding alternative approaches to increase their market share (Irsova and Havranek 2013; Smeets 2011). Moreover, MNEs have the option of licensing their IP to non-affiliate domestic parties by charging premium royalty fees (Maskus 2000:168). Domestic firms, who will have to pay a premium license for gaining direct access to the MNE's IP assets, will operate with thinner margins that impact their productivity. However, both conditions do not enable domestic firms to benefit from FDI horizontal spillovers. Strong public IP enforcement will also limit the knowledge and know-how spillovers from the opportunistic behaviour of former employees of MNEs who are aware that their former employer will seek to enforce the restrictive contracts signed when they joined the MNE (Agarwal et al. 2009). Lastly, the prospect for domestic firms to illegally acquire MNEs' IP is diminished as domestic firms are aware that under strong public IP enforcement, illegal actions will be detected and infringers will be prosecuted and penalised.

Overall, although strong IP law protection can allow MNEs to transfer high value IP assets in a host country, strong public IP enforcement is expected to

negatively moderate the direct and indirect horizontal FDI productivity spillovers to domestic firms. Therefore it can be expected:

Hypothesis 3: *The strength of public IP enforcement in a country negatively moderates the relationship between stronger IP law protection and FDI horizontal spillovers.*

3.4. Data and Methods

3.4.1. Meta-analysis: protocol and method

This study adopts a meta-analysis approach by aggregating the findings from existing primary empirical research and using those findings to assess the effect of the strength of IP law protection and the strength of public IP enforcement on FDI horizontal productivity spillovers. Meta-analysis provides a systematic approach to reviewing an existing body of literature by statistically integrating the results of a large set of studies on a particular topic, in one single empirical analysis (Lipsey and Wilson 2001; Mayer-Haug et al. 2013; Meyer and Sinani 2005). This methodology can also provide unique insights in areas where multiple studies yield conflicting results as it allows testing of relationships which cannot be addressed by individual studies (Mayer-Haug et al. 2013; Meyer and Sinani 2005). It can thus play a crucial role in advancing knowledge, finding effects or relationships that are obscured in other ways of summarizing research and provide directions for theory building and future research (Garcia-Meca et al. 2006; Mayer-Haug et al. 2013; Reus and Rotting 2009).

The study builds on and extends the work of the two existing meta-analysis in the area of FDI horizontal productivity spillovers, by Meyer and Sinani (2009) and Irsova and Havranek (2013). It extends their work by considering the separate effect of the second element of IP systems, the strength of public IP enforcement, as well as the moderating effect of strong public IP enforcement on the relationship between IP law protection and FDI horizontal productivity spillovers.

3.4.2. Selection of primary literature

In order to select the most appropriate primary literature and establish a comprehensive database for this study a three-step approach is followed. First, the selection of primary literature is restricted to studies capturing the years 1998-2011 and 49 developed and developing countries. This is because the scores of the main independent variable that used to approximate for the strength of public IP enforcement, the international patent systems strength index (IPSS) by Papageorgiadis et al. (2014), is available for this specific time period and country range. Second 20 relevant FDI spillover studies (published and unpublished) have been identified in the reference lists of the two previous meta-analytical studies by Meyer and Sinani (2009) and Irsova and Havranek (2013). Third, the search is expanded in three established scientific databases (Proquest, Science direct, EconLit databases) and the scientific search engine Google Scholar in order to identify relevant FDI horizontal spillover studies. In line with the keywords used by Meyer and Sinani (2009), a combination of the search terms 'foreign direct investment/FDI spillover*', 'foreign direct investment/FDI horizontal spillover*''productivityspillover*', 'productivity horizontal spillover*''knowledge spillover*', 'technolog*spillover*', 'knowledge transfer spillover*', 'knowledge transfer horizontal spillover*'is used to search in the titles and abstracts of studies included in these databases. From this process another 29 studies where identified and included in the dataset. Following these three steps 49 published and unpublished empirical papers on FDI horizontal spillovers were identified and included in the final dataset.[13]Table

[13]Stanley and Doucouliagos (2012) highlight that unpublished studies should be routinely included in a meta-analysis, unless the meta-analysts can reasonably argue that the unpublished studies are of lower quality and may taint the meta-analysis.

3.1 below provides a summary of the characteristics of each of the studies that are included in the dataset, in terms of the country of focus, the year studied and the level of focus of each study. It is important to note that the multiple FDI horizontal spillover estimates are reported in each of the 49 studies and therefore a panel meta-analysis approach is required.

Table 3.1. The empirical studies on FDI horizontal spillovers included in the meta-analysis

Study	Country	Data year	Aggregation
Ben Hamida (2013)	Switzerland	2001-2004	Firm level
Ben Hamida and Gugler (2009)	Switzerland	1998-2001	Firm level
Blake et al. (2009)	China	2000	Firm level
Buckley et al. (2007).	China	2001	Industry level
Buckley et al. (2007b)	China	2001	Industry level
Chang and Xu (2008)	China	1998-2005	Firm level
Chang et al. (2007)	China	2002-2005	Firm level
Crespo et al. (2009)	Portugal	1996-2000	Firm level
Du et al. (2012)	China	1998-2007	Firm level
Erdogan (2011)	Turkey	2004-2008	Firm level
Fu (2012)	UK	1998-2004	Firm level
Geršl (2008)	Czech Republic	2002-2005	Firm level
Gersl et al. (2008)	Czech republic, Hungary, Poland, Slovakia, Romania	2000-2005	Industry level
Girma and Gong (2008)	China	1999-2002	Firm level
Gonçalves (2005)	Brazil	1997-2000	Firm level
Hagemejer and Kolasa (2011)	Poland	1996-2005	Firm level
Halpern and Muraközy (2007)	Hungary	1996-2003	Firm level
Javorcik and Spatareanu (2008)	Romania	1998-2003	Firm level
Javorcik and Spatareanu (2011)	Romania	1998-2003	Firm level
Javorcik et al. (2004)	Romania	1998-2000	Firm level
Jeon et al. (2013)	China	1998-2007	Firm level
Khalifah and Adam (2009)	Malaysia	2000-2004	Firm level
Kolasa (2008)	Poland	1996-2003	Firm level
Laenarts and Merlevede (2011)	Romania	1996-2005	Firm level

Liang (2008)	China	1998-2005	Firm level
Lin et al. (2009)	China	1998-2005	Firm level
Liu et al. (2009)	China	1998-2001	Firm level
Lutz and Talavera (2004)	Ukraine	1998-1999	Industry level
Mariotti et al. (2011)	Italy	1999-2005	Firm level
Mebratie and Arjun (2013)	S. Africa	2003	Firm level
Merlevede and Schoors (2007)	Romania	1996-2001	Firm level
Merlevede and Schoors (2009)	Romania	1996-2001	Firm level
Merlevede et al. (2014)	Romania	1996-2005	Industry level
Nicolini and Resmini (2010)	Poland	1998-2003	Firm level
Qiu et al. (2009)	China	2001-2006	Industry level
Reganati and Sica (2007)	Italy	1997-2002	Firm level
Sarkar and Lai (2009)	India	2005	Firm level
Schoors and van der Tol (2002)	Hungary	1997-1998	Firm level
Sun (2011)	China	2003	Firm level
Tang (2008)	China	1998-2001	Firm level
Tian (2007).	China	1996-1999	Industry level
Tomohara and Yokota (2006)	Thailand	1999-2001	Firm level
Wang and Yu (2007)	China	2001	Industry level
Wang and Zhao (2008)	China	2000-2002	Industry level
Wang et al. (2012)	China	1998-2006	Industry level
Wei and Liu (2006)	China	1998-2001	Industry level
Xu and Sheng (2012)	China	2000-2003	Industry level
Xu and Sheng (2012)	China	2000-2003	Industry level
Zhang et al. (2010)	China	1998-2003	Firm level

3.4.3. Effect size and estimation method

With regards to the coding of the effect size, the previous studies used three different effect sizes; i) t-statistics extracted from regressions, ii) calculated semi-elasticities, iii) coefficients extracted directly from the regressions (Roberts and Stanley 2006; Stanley and Doucouliagos 2012). To be included in the

meta-analysis, the selected effect size needs to meet two certain criteria. First the effect size should measure the effect of one variable on another holding other factors constant. Second, the effect size should be comparable within and between different studies. The criteria that the effect sizes need to be comparable across studies usually rules out the direct use of regression coefficients. Regarding the use of semi-elasticities it is important to note that only those estimates that use the same scale for the independent variables can be combined otherwise the semi-elasticities are not directly comparable (Stanley and Doucouliagos 2012). For instance, even though coefficients from log-log models can be interpreted as elasticities, it is not possible to do so for coefficients from linear models as these need to first be transformed into elasticities (if all the necessary information is available) (Koetse et al. 2009).The use of the t-statistic also has the advantage of being comparable across studies It is most often provided by the spillover studies and unlike semi-elasticities it doesn't require additional data for its calculation.

In this meta-analysis t-statistics are used for the construction of the dependent variable. Specifically, a categorical effect size is coded for the dependent variable, using 0, 1, and 2 to represent significantly negative, insignificant and significantly positive estimate respectively, adopting a significance level of 5%. The model that is generally applied in a meta-analysis with a categorical effect size is the ordered probit model (Koetse et al. 2009). This approach has been used in other meta analyses, for example De Groot et al. (2015) on agglomeration externalities, Card et al. (2010) on the effectiveness of active labour and Koetse et al. (2009) on the impact of uncertainty on investment behaviour. Because the estimated coefficients from an ordered probit model

should not be used for inference, the marginal effects need to be reported (Verbeek 2017). The marginal effect shows the change in the probability of finding a specific outcome. This means that for each of the independent and control variables in the model the changes in the probability of obtaining a significantly negative, an insignificant, and a significantly positive estimate are to be calculated (Koetse et al. 2009). This leads to the use of a probit meta-analysis with the inclusion of marginal effects (see Koetse et al. 2009; Card et al. 2010; Groot et al. 2015, for recent examples in this setting). Specifically, the model assumes of a latent variable y_{ij}^{*} can be explained by a set of independent variables in the following form, in which lower case i and j stand for i^{th} observation (estimate) and j^{th} study respectively.

$$y_{ij}^{*} = \sum_{k=1}^{22} \beta_{k} Z_{k,ij} + \varepsilon_{ij}$$

Where y_{ij}^{*} is the latent variable and $\boldsymbol{\varepsilon_{ij}}$ is the error term that is assumed normally and *iid* distributed. $Z_{k,ij}$ refers to a vector of K independent variables and β_{k} is the corresponding coefficient vector. The latent variable y_{ij}^{*} is coded as follows:

Category A: y=0 if an estimate is negative and statistically significant

Category B: y=1 if an estimate is statistically insignificant (either negative or positive)

Category C: y=2 if an estimate is positive is statistically significant

3.4.4. Independent variables

To approximate for the strength of IP law protection the widely used index of patent protection strength developed by Park (2008)is employed. This index

measures the strength of patent related legislation in 122 countries for the years 1960 – 2005 (Park 2008). The scores of the index range from 0 to 5, with higher values indicating stronger levels of patent law protection in a country (Ginarte and Park 1997). It is important to note that the focus of this index is on the availability of patent laws and legal mechanisms (such as the laws that enable the enforcement of IP) but it does not capture the effectiveness with which the law is enforced in practice by public IP enforcement agents (Arora 2009; Brander et al. 2017; Park 2008).

To approximate for the strength of public IP enforcement the Index of Patent Systems Strength (IPSS) developed by Papageorgiadis et al. (2014)is employed. The IPSS captures the level of transaction costs that patent owners face when engaging with the public patent enforcement agents in an IP system. It is an annual longitudinal composite measure that provides annual scores for the time period 1998-2011, for 48 countries. The index scores range from 0 to 10 with high scores indicating to patent systems where public patent enforcement agents effectively implement patent law in practice and low scores indicate to countries where public patent enforcement levels are weak (Papageorgiadis et al. 2014). It is important to note that the IPSS is a composite indicator comprising of three constructs informed by the transaction costs theory, namely: (i) monitoring costs determined by the effectiveness and strength of police and border enforcement agents as well as influenced by the societal attitudes and public commitment towards the enforcement of patent rights; (ii) property rights protection costs related to the strength, impartiality, and effectiveness of judicial aspects of a patent institution as well as to the strength of judicial enforcement in a country; and (iii) servicing costs related to

the quality and effectiveness of public agencies that are responsible to effectively administer patent laws and regulations or private companies that enable the administration of patents within a country. The advantage of this index is that it captures the effectiveness of multifaceted IP systems.

3.4.5. Country level variables

In this meta-analysis, three country level variables are introduced in to control for country level financial development, labour quality, and trade openness (Diebel 2010; Solow 1999). It is suggested that domestic firms need to have access to financing in order to benefit from the foreign advanced technology and incorporate it into their production processes (Irsova and Havranek 2013). As such domestic firms in countries with well-developed financial systems are more likely to experience positive changes in their productivity as a result of the foreign presence. On the contrary domestic firms in countries with less developed financial system are more likely to experience difficulties in accessing financial capital and hence experience negative or insignificant changes in their productivity (Irsova and Havranek 2013). In respect to labour quality, it is argued that advanced human capital enables domestic firms to acquire and develop capabilities that can increase their absorptive capacity and shorten the technological gap between the foreign affiliates and the domestic firms (Meyer and Sinani 2009). To proxy for the quality of human capital, FDI spillover studies often use the number of candidates enrolled in tertiary education in a host country (Irsova and Havranek 2013; Meyer and Sinani2009). With regards to trade openness, it is commonly expected in the literature that domestic firms operating in countries open to international trade, are more likely to get exposed to advanced foreign technology and thus acquire

knowledge and skills that they can utilise to compete with the foreign affiliates and benefit from spillover effects (Irsova and Havranek 2013; Meyer and Sinani 2009).While there is a possibility that domestic firms operating internationally may have little to learn from the foreign affiliates in their country as they have already been exposed to advanced technologies through trade, control for the effect of trade openness is still warranted (Irsova and Havranek 2013).

Table 3.2. Definition of variables and sources of data

Variable	Definition	Data source
$\mathbf{C_{sig}}$	Categorical dependent variable: =0 if spillover estimates are negative, =1 if spillover estimates are insignificant, =2 if spillover estimates are positive.	
IP law protection	Park (2008) patent protection index The index ranges from 0 to 5 with higher values indicating stronger levels of patent protection.	Park (2008)
Public IP enforcement	Papageorgiadis et al., (2014) IPSS index The index ranges from 0 to 10 with higher scores indicating stronger enforcement levels	Papageorgiadis et al., (2014)
	Country level variables	
Trade openness	Trade (%GDP)	World bank - World Development Indicators
Tertiary education	The tertiary school enrolment rate in the country	World bank - World Development Indicators
R&D	R&D expenditures (%GDP)	World bank - World Development Indicators
Financial development	Domestic credit provided by financial sector (% of GDP)	World bank - World Development Indicators
	Data characteristics	
Cross sectional data	= 1 if cross sectional are used, = 0, otherwise	
Industry level data	= 1 if industry level data are used, = 0, otherwise	
No. of observations	The number of observations used in each study	

Time span	The number of years of the data used
	Specification characteristics
Foreign presence in employment	=1 if proxy for foreign presence is measured in terms of employment share, = 0, otherwise
Foreign presence in equity	=1 if proxy for foreign presence is measured in terms of equity share, = 0, otherwise
Technological gap	=1 if the study controls for technological gap, = 0, otherwise
	Estimation characteristics
Olley-Pakes	=1 if the Olley-Pakes method is used for the estimation of total factor productivity, =0 otherwise
OLS	=1 if the Ordinary Least Squares method is used for the estimation of total factor productivity, =0 otherwise
GMM	=1 if the system General Method of Moments estimator is used for the estimation of spillovers, =0 otherwise
Year fixed	=1 if year fixed effects are included, =0 otherwise
Sector fixed	=1 if sector fixed effects are included, =0 otherwise
	Publication characteristics
Amadeus	=1 if the Amadeus database is used, =0 otherwise
Publication	=1 if paper published in a peer reviewed journal, =0 otherwise
Vertical spillovers	=1 if vertical spillovers are included in the regression, =0, otherwise

3.4.6. Study specific variables

It is also common in meta-analysis studies to control for the characteristics of the studies as the research design used may have an effect on the size of the coefficient found in the spillover studies and the calculated t-statistics (Gorg and Strobl 2011). Following Gorg and Strobl (2001) the following set of study characteristics are considered: a) data characteristics, b) model specification characteristics, c) estimation characteristics and d) publication characteristics.

With regards to data characteristics, first a dummy variable is created to capture if a study is using panel or cross-sectional data. In the literature it is observed that cross-section studies report higher coefficients of the effect of foreign presence than panel data studies (Gorg and Strobl 2001; Wooster and Diebel 2010). This can be explained as panel level data allow the researcher to observe the productivity growth of domestic firms over a longer time span and thus allow for the disentangling of the impact of time invariant firm specific factors on domestic firms' productivity from that of the foreign presence (Gorg and Greeanway 2003; Hanousek, et al. 2011). Second, a dummy variable is created to capture if a study is using firm or industry level data. It is suggested that studies using industry level data find positive significant results whereas studies using firm level data find negative or insignificant results (Gorg and Greenaway 2003). This is so because industry level data measure the aggregated productivity of the industry covering both foreign and domestic firms, and because foreign affiliates tend to have higher productivity, industry's productivity may be higher even in the absence of FDI horizontal spillovers (Gorg and Greeanaway 2003). Third, the length of the period covered is introduced inas a proxy for the distinction between long-run and short run effects (de Groot et al. 2015) and the log of the number of observations is introduced in to control for sample size of the study (Meyer and Sinani 2009) as large sample tend to induce high t-statistics.

Apart from data characteristics, a set of dummy variables are created for model specification characteristics including a) foreign presence measurement, and b) technological gap.

Foreign presence in FDI horizontal spillover studies is measured by the share in industry sales, employment or equity (Gorg and Greenaway 2003; Meyer and Sinani 2009). However as Wooster and Diebel (2010) suggest most often the selection is made on the 'basis of data availability and reliability, and the choice is not necessarily made on the basis of theory' (2010: 642); as such results may vary based on the measurement used for the foreign presence (Gorg and Strobl 2001). For instance, if foreign equity capital is applied, then the positive spillover effects may indicate that the foreign presence produces positive capital spillover and that FDI horizontal spillovers may be closely related to 'the demonstration effect of the suitability of the project, the superiority of machinery or equipment embodying updated technologies'(Liu et al. 2009). On the other hand, if foreign presence is measured in terms of employment, then the FDI horizontal spillovers is likely to be closely associated with the labour turnover channel (Liu et al. 2009; Wei and Liu 2006). Lastly, if foreign presence is measured in terms of sales then FDI horizontal spillovers are linked with knowledge diffusion of the superior product and marketing skills (Liu et al. 2009; Wei and Liu 2006). To take into account of measurement differences, two dummies are created and introduced in the analysis, one for studies using the share in employment and the other for studies using foreign equity share in an industry.

Most of the FDI spillovers review papers conclude that technological gap is a decisive factor of FDI horizontal spillovers (Gorg and Greenaway 2003; Crespo and Fontoura 2007). If the technological gap between domestic and foreign firms is too large domestic firms are less likely to be able to use the demonstration channel to benefit from the foreign presence (Sjöholm 1999; Irsova and Havranek 2013). On the other hand if the technological gap is too

small domestic firms may have too little to learn from the foreign investors (Irsova and Havranek 2013). Therefore a dummy variable is created to capture if a study controls for the technological gap.

Moreover a set of dummy variables are created to control for estimation methods used in the FDI horizontal spillover studies such as; a) Olley-Pakes method, b) Ordinary Least Squares regression (OLS), c) Generalized method of moments (GMM) method, d) year-fixed effects model and c) sector-fixed effects model. Although most of the studies use the production function and the OLS estimation technique there are studies which follow alternative estimation techniques such as GMM, Olley-Pakes etc.[14] Therefore five dummies are introduced in to control for the effect of estimation characteristics on the FDI horizontal spillovers.

Lastly, following de Groot et al. (2015), Koetse et al. (2009), Gorg and Strobl (2001) and Irsova and Havranek (2013) three dummy variables are created to control for the effect of publication characteristics on FDI horizontal spillovers namely; a) peer reviewed articles, b) FDI vertical spillovers and c) Amadeus database. An important concern in meta-analysis is publication selection bias (Stanley and Doucouliagos 2012). Publication selection bias could arise because researchers may treat statistically significant results that support their hypotheses more favourably, and because reviewers and editors of academic journals may favour papers with statistically significant results (Gorg and Strobl 2001; Irsova and Havranek 2013). To address this issue, a dummy variable is

[14] The different estimation methods may allow researchers to overcome certain econometric problems and thus influence the final results. For instance Olley-Pakes is said to be remarkably robust to different form of measurement and specification errors (Liu et al. 2009) while the GMM overcomes issues related with endogenous regressors, measurement error, and weak instruments (Kahouli and Maktouf 2015).

created for peer reviewed articles to test for publication bias. In some studies, both FDI horizontal and vertical productivity spillovers (instead of focusing on FDI horizontal spillovers only) are examined. Studies that consider both types of spillovers are more likely to be published even if they find insignificant or negative horizontal FDI spillovers (Javorcik 2004). To control for this type of potential publication bias, a dummy variable is created with a value of 1 assigned for studies that also include FDI vertical spillovers in their empirical models. Another issue in respect to publication characteristics is the incomplete nature of datasets used to estimate spillover effects (Eapen 2013). Majority of recent studies use datasets of firms sourced from secondary data sources such as Compustat, Amadeus and Prowess (Eapen. 2013:721). A major issue for using such secondary datasets is that they tend to over-represent large firms (Eapen 2013). Thereof a dummy variable is created to control for the effect of Amadeus database on the FDI horizontal spillovers.

3.5. Results

Findings on whether FDI horizontal spillovers in host countries are present are mixed. The majority of existing FDI horizontal spillover studies emphasise domestic firms' heterogeneity in order to explain these mixed results. Taking an endogenous growth theory perspective, they suggest that domestic firms with higher levels of absorptive capacity stand to benefit most from FDI horizontal spillovers (Gorg and Greenaway 2003). This study adopts an institutional theory perspective arguing that a host country's institutions, and more specifically the IP system in force, can shed light on the existing mixed research findings. Apart from considering the IP system as a country condition affecting FDI spillover benefits, this study, through its results, attempts to identify potential links between the strength of the IP systems in the host country and its effect on the domestic firm's absorptive capacity.

Table 3.3 provides the descriptive statistics of all the variables included in the empirical estimation and Table 3.4 presents the ordered probit estimates and associated marginal effects of the models. The results in general provide clear and consistent support for the central thesis of this study, that the strength of the public IP enforcement element of IP systems has a direct effect on FDI horizontal productivity spillovers. Importantly, it reveals that the strength of public IP enforcement negatively moderates the relationship between the strength of IP law protection and FDI horizontal productivity spillovers. More specifically, and in relation to Hypothesis 1, the strength of IP law protection has a positive and statistically significant (4.041, $p<0.001$ in Model 1) effect on FDI horizontal productivity spillovers. This finding therefore supports Hypothesis 1 regarding the positive impact of IP law protection strength on the impact of FDI

to domestic competitors. Strong IP law protection allows for the delimitation of the legal boundaries inside which MNEs can register and be granted their IPR. Such conditions decrease MNEs' external uncertainty and thus transaction costs, increasing the incentives to invest in such countries and transfer innovative IP (Bénassy-Quéret et al. 2007; Bevan et al. 2004; Seyoum 2006). This result is not surprising given that the signing of the TRIPs agreement in 1995 was underpinned by the expectation that improving the strength of IP law protection in a country, will boost FDI and technology transfer levels globally. As the results related to Hypothesis 1 reveal, domestic firms in the host countries are likely to benefit from this boost by gaining access to more advanced IP assets via the spillover channels. Although the increased FDI flows is an opportunity for domestic firms, the adoption, reconfiguration and exploitation of MNEs' knowledge is a complex process requiring the possession of advanced capabilities (Teece 2007). Thus, domestic firms will need to develop the necessary dynamic capabilities by practicing innovation if they intend to benefit from the foreign presence. Strong IP law protection in the country can offer incentives for domestic firms to engage in R&D activities and develop/improve their innovative capabilities and build their absorptive capacity to benefit from MNEs' IP. This result however challenges the findings of the previous meta-analytic study by Irsova and Havranek (2013), who found that the strength of IP law protection had a negative effect on FDI horizontal productivity spillovers, and Smeets and de Vaal (2016) who found an insignificant relationship. The discrepancy in the results may be due to the theoretical reasoning and empirical approach followed by Irsova and Havranek (2013) and Smeets and de Vaal (2016). This is because although the authors aimed to identify the effects of the

strength of the entire IP system of a host country, they did so without incorporating the effect of the second aspect of IP systems, namely the strength of public IP enforcement. As it becomes more evident with the testing of Hypothesis 2, the difference in the findings may be due to the omitted variable bias in Irsova and Havranek's (2013) and Smeets and de Vaal's (2016) theoretical and empirical approach.

Table 3.3 Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Coefficient	1,567	33.15248	1253.319	-185.29	49606
t-statistic	1,524	0.410782	2.485393	-8.5	9.705882
Stand.Error	1,322	2.308069	17.89762	-25.148	296.3402
Public IP enforcement	1,567	4.262189	1.084418	3.4	8.85
IP law protection	1,567	3.407564	0.507399	2.12	4.6
IPSS*Park	1,567	14.733	5.753241	8.904	39.6796
Trade openness	1,560	61.23309	24.32289	20.02019	205.5394
Financial development	1,566	77.21249	53.35781	15.58633	192.6601
Tertiary education	1,566	22.8592	14.94979	0	59.72396
R&D	1,566	0.758734	0.350494	0.257087	2.67692
Cross sectional data	1,567	0.068966	0.253396	0	1
Industry level data	1,567	0.298851	0.457754	0	1
Time span	1,567	6.699872	2.853035	1	10
No.of observations	1,567	201806.3	439790.5	27	3572000
Ln No. of observations	1,566	10.30881	2.555682	3.295837	15.08864
Foreign Presence_	1,567	0.390805	0.487930	0	1

employment		5	1		
Foreign Presence_equity	1,567	0.155811	0.362676	0	1
Technological gap	1,567	0.096424	0.295172	0	1
Vertical spillovers	1,567	0.808429	0.393537	0	1
Olley-Pakes	1,567	0.168582	0.374383	0	1
OLS	1,567	0.583653	0.492953	0	1
GMM	1,567	0.219668	0.414022	0	1
Sector fixed	1,567	0.238187	0.425974	0	1
Year fixed	1,567	0.471264	0.499174	0	1
Publication	1,566	0.446999	0.497342	0	1
Amadeus	1,567	0.338442	0.47318	0	1

Table 3.4 Empirical estimation and associated marginal effects of meta-analysis ordered probit model

		Marginal effects model (1)		
	Ordered Probit Model (1)	**Significantly Negative**	**Insignificant**	**Significantly Positive**
Public IP enforcement	3.625*** (5.61)	-008212576** (-2.64)	-0.3570526 (-1.77)	1.17831* (2.51)
IP law protection	4.041*** (5.45)	-0.9153762** (-2.65)	-0.397972 (-1.83)	1.313348** (2.57)
IPSS*GP	-0.862*** (-5.61)	0.1951998** (2.60)	0.848657 (1.76)	-0.2800654* (-2.48)
Trade openness	0.00325 (1.26)	-0.0007354 (-0.71)	-0.0003197 (-0.70)	0.0010551 (0.71)
Tertiary education	0.0270*** (4.21)	-0.0061253 (-1.32)	-0.0026631 (-1.15)	0.0087884 (1.30)
Financial development	-0.00756*** (-3.34)	0.0017116* (2.28)	0.0007441 (1.50)	-0.0024558** (-2.08)
R&D	0.464* (2.02)	-0.105154 (-1.07)	-0.0457171 (-0.94)	0.1508711 (1.05)
Cross sectional data	-0.308	0.0697335	0.0303176	-0.1000511

	(-1.27)	(0.61)	(0.62)	(-0.62)
Industry-level data	1.140***	-0.258263**	-0.1122833*	0.3705463**
	(6.20)	(-3.02)	(-2.08)	(3.03)
No. of observations	-0.000000107	2.43e-08	1.06e-08	-3.49e-08
	(-1.01)	(0.35)	(0.35)	(-0.35)
Time Span	-0.122***	0.258263*	0.0120474	-0.0397577*
	(-4.96)	(-3.02)	(1.91)	(0.62)
Foreign presence_	-0.282*	0.0638353	0.0277532	-0.0915885
Employment	(-2.31)	(1.22)	(1.13)	(-1.22)
Foreign presence_	0.724***	-0.1639706*	-0.0712884*	0.235259*
equity	(6.06)	(-2.79)	(-2.21)	(2.97)
Technological gap	-0.884***	0.2002845*	0.0870763	-0.2873608*
	(-4.09)	2.21)	(1.66)	(-2.15)
Olley-Pakes	-0.372**	0.0842593	0.0366328	-0.1208921
	(-2.83)	(1.20)	(1.22)	(-1.24)
OLS	-0.737***	0.1669559*	0.0725863	0.2395422*
	(-7.05)	(2.36)	(1.71)	(-2.29)
GMM	-1.078***	0.2442431**	0.1061879**	-0.3504311*
	(-6.88)	(2.60)	(1.82)	(-2.52)
Year fixed	-0.779***	0.1763574***	0.766737	-0.2530311***
	(-6.88)	(3.59)	(2.12)	(-3.46)
Sector fixed	0.346*	-0.0782774	-0.0340321	0.1123095
	(2.15)	(-0.72)	(-0.64)	(0.70)
Publication	-0.420**	0.0952413	0.0414074	-0.1366487
	(-3.19)	(1.39)	1.13	-1.34
Amadeus	0.645***	-0.1461442	-0.0635381	0.2096824
	(3.54)	(-1.35)	(-1.29)	(1.38)
Vertical spillovers	-0.0858	0.0194378	0.0084508	-0.0278886
	(-0.56)	(0.30)	(0.29)	(-0.30)
Number of observations	**1560**			

t statistics in parentheses $^{*}p< 0.05$, $^{**}p< 0.01$, $^{***}p< 0.001$

The testing of Hypothesis 2 reveals an important finding that makes a contribution to the existing literature, in that the strength of public IP enforcement has a positive and statistically significant (3.625, p<0.001 in Model 1) impact on FDI horizontal productivity spillovers. While the role of the strength of the public IP enforcement element of IP systems in stimulating FDI horizontal productivity spillovers has been ignored in the existing literature, the results of this study showcase a significant direct positive effect. Strong enforceability of IP law protection reduces the opportunistic behaviour of domestic competitors

to illegally access and misappropriate MNEs' IP as they are cognisant that illegal actions will be detected and penalised. As such, it creates incentives for MNEs to first invest in such countries and transfer/register/develop advanced IP, and second to enter in more collaborative activities with the locals (JV or licensing). Since strong public IP enforcement allows for the register and development of MNEs' advanced IP, domestic firms with the necessary absorptive capacity can access MNEs' publicly displayed knowledge via patent disclosures. Utilising the demonstration channel, domestic firms can acquire valuable information on MNEs' advanced knowledge enclosed in their patent applications, reconfigure it and develop their own advanced knowledge. The results also confirm that strong public IP enforcement can significantly support the establishment of lawful co-operation and knowledge transfer between MNEs and domestic firms, boosting the productivity spillovers of the latter. The fact that the meta-analysis results support Hypothesis 2, allows this study to reveal a new IP institutional mechanism that affects FDI horizontal productivity spillovers, demonstrating the importance for future studies to consider the distinct effects of the strength of public IP enforcement. In addition, this result provides further support to Brander et al. (2017), who conceptually highlighted the differences between the strength of the availability of IP law protection as it appears on the books and the actual strength of public IP enforcement, as well as the benefits that host countries experience from the strengthening of public IP enforcement.

With regards to Hypothesis 3, the results bring forward a further explanation for the conflicting results of the previous empirical studies that did not consider the second element of IP systems, the strength of public IP enforcement. This study

identifies a second previously unexplored institutional mechanism of the functioning of IP systems, in that strong public IP enforcement has a statistically significant negative moderating effect on the relationship between strong IP law protection and FDI horizontal productivity spillovers (-0.862, $p<0.001$ in Model 1).The results therefore support Hypothesis 3. Strong IP law protection and IP enforcement decrease the opportunistic behaviour of domestic firms to illegally access MNEs' knowledge and consequently block the illegal and legal diffusion of MNEs' knowledge via the spillover channels. Although in a similar situation (see Hypothesis 2) domestic firms managed to utilise the benefits of a strong IP enforcement regime and improve their productivity by engaging in collaborative activities with the MNEs, now the 'rules of the game' have changed. Under strong IP law protection and public IP enforcement, MNEs can transfer their entire IP portfolios and seek to appropriate it by blocking competition (Allred and Park 2007; Maskus 2000:87; Smeets and de Vaal 2016). MNEs are found to enjoy strong market power which enables them to out-compete domestic firms. The strong market power of MNEs, attracts market demand away from domestic firms leading to a crowd out effect, resulting in a decline in their profitability and productivity (Aitken and Harrison 1999; Smeets and de Vaal 2016). The monopolistic position of the MNEs resulting from the accumulated IP and its strong protection and enforcement, forces domestic firms competing in a tight technological landscape (that does not provide them with sufficient technological space), o respond to the competitive pressures, given that investment in R&D may be threatened by IP litigation from the MNEs. Moreover, in such a setting domestic competitors have less negotiating power when attempting to collaborate (JV or licensing) with the MNEs and achieve a suitable

licensing rate.. Therefore, the discovery of the direct and moderating role of the strength of pubic IP enforcement on FDI horizontal productivity spillovers, demonstrates two institutional mechanisms that were previously not accounted for in existing studies and had an effect on the competitive functioning of host markets, influencing the ability of MNEs and domestic firms to compete. Future studies need to consider the differential effects of both elements of an IP system and how the strength of IP enforcement can moderate the effects of IP law protection on FDI horizontal productivity spillovers and other economic phenomena (depending on the study's focus).

With regards to the estimations relating the effects of other country level variables, the findings are in line with some of the existing studies. The coefficient of trade openness, although positive, is statistically insignificant suggesting that domestic competitors' experience or inexperience of international trade neither enhances nor inhibits their ability to compete with the foreign affiliates. The coefficient of financial development is negative (-0.00756) and statistically significant ($p<0.001$). This finding refutes the argument that domestic firms operating in countries with less developed financial systems are more likely to experience negative changes to their productivity as a result of the foreign presence, mostly due to the competition effect (Irsova and Havranek 2013).

The coefficients corresponding to tertiary education and R&D expenditures are positive and statistically significant (0.0270, $p<0.001$ and 0.464, $p<0.05$ respectively) supporting the theoretical argument that firms in countries with advanced human capital and more R&D investment, are likely to better absorb and utilise the foreign advanced technology (Irsova and Havranek 2013).

With respect to the control variables, the results show that studies using industry-level data find stronger FDI horizontal spillovers effects. This finding is in line with Meyer and Sinani (2009), but in contrast with Gorg and Strobl (2001) who find an insignificant relationship. However, in contrast with Meyer and Sinani (2009) and Gorg and Strobl (2001), this study's findings also suggest that it does not appear to matter whether a study uses cross-sectional or panel level data. The results also suggest that the choice of a foreign presence proxy, is a determinant of the differences across studies. Most studies use the share of employment/sales or equity in foreign-owned firms as a proxy to capture the degree of foreign presence in the country. By including separate dummy variables for whether a study uses foreign equity or foreign employment share, the evidence suggests that the former produces negative results ($p<0.05$) while the latter produces positive results ($p<0.001$) (Gorg and Strobl 2001). These results indicate that the way researchers define and proxy the foreign presence does make a difference on their final outcomes. This study also finds evidence that whether or not studies control for FDI vertical spillovers, when estimating FDI horizontal spillovers, does not seem to matter. Regarding the technological gap, the coefficient is negative and statistically significant ($p<0.001$) suggesting that studies controlling for the technological gap between foreign and domestic firms tend to find more negative spillover effects. Another important observation, concerns the estimation techniques researchers use to estimate FDI horizontal spillovers. When researchers use the Olley-Pakes, OLS, GMM and year fixed effect estimation techniques, they tend to find more negative significant spillover effects, whereas studies using the sector fixed effect estimation technique yield positive significant results. The coefficient on the publication variable is negative

(-0.420) and statistically significant ($p<0.01$), indicating the presence of publication bias in the meta-regression model. This finding suggests that peer reviewed journals also publish papers that find negative spillover effects. This is different from the conventional argument that authors are more likely to report significantly positive FDI spillovers results, or that academic journals tend to publish studies with statistically significant positive results. The difference between this study's results and previous meta-analysis of FDI horizontal spillovers, can be attributed to the fact that most of the studies included in this meta-analysis also consider FDI vertical spillovers and therefore, are more likely to report results in line with that of Javorcik et al. (2004), which arguably is the most influential study on FDI vertical spillovers. Moreover, the Amadeus database is positive and statistically significant indicating that studies extracting their data from this database tend to find positive spillover effects.

Table 3.4 also reports the marginal effects of the meta-analysis ordered probit model. The interpretation of marginal effects differs from the interpretation of the ordered probit model because they measure a non-linear relationship. Therefore, for continuous variables (such as the IPSS index, Park (2008) index, IPSS*Park, trade openness, financial development, R&D and human capital) marginal effects show the probability change from increase of the dependent variable by 1. With regards to this study's empirical results, the IPSS index is found to have a positive and statistically significant at $p<0.05$ effect indicating that as public IP enforcement levels becomes stronger the probability of domestic firms to experience positive changes in their productivity increases. So for instance, holding other variables constant at their means, the probability of domestic firms experiencing positive changes in their productivity as public IP

enforcement is strengthened, is 0.001*1.178=0.00118. Along the same lines, the Park (2008) index has a positive and statistically significant ($p<0.01$) effect, suggesting that as IP law protection becomes stronger, the probability of domestic firms to experience positive changes in their productivity increases. However, the marginal effect for the moderator variable is negative and statistically significant ($p<0.05$) indicating that as public IP enforcement in host countries strengthens, it has a negative moderating effect on the relationship between high levels of IP law protection and FDI horizontal spillovers and thus increases the probability for domestic firms to experience negative changes in their productivity. Thus, the marginal effects findings are consistent with the ordered probit findings supporting Hypotheses 1, 2, and 3. In respect to the binary variables (such as industry level data, technological gap, GMM etc.), marginal effects are interpreted in respect to how the dependent variable changes as the binary variable moves from 0 to 1. Indicative and holding other variables constant at their means, the industry level variable is positive and statistically significant ($p<0.01$), showing that there is greater likelihood for studies using industry level data to find positive spillover effects compared to studies using firm level data. In other words, the predicted probability of finding positive spillover effects is 0.37 greater for studies using industry level data than those using firm level data. Similarly, the use of the GMM estimation is found to be negative and statistically significant ($p< 0.05$). This suggests that studies using the GMM estimation technique tend to have a higher probability of finding negative spillover effects.

One important criticism of meta-analyses is that they include both industry and firm level studies in their sample. The inclusion of industry level studies may

provide a distorted result for the magnitude of FDI spillovers, as they measure the aggregated productivity of the industry and not the domestic firms' productivity exclusively (Gorg and Strobl 2001). Since MNEs tend to have higher productivity, industry's productivity may be even higher in the absence of FDI horizontal spillovers (Gorg and Greenaway 2003). To control for this issue, a robustness test was performed in this meta-analysis by dividing the sample into firm and industry level studies. It is done as this study intends to show that the findings of the original dataset (firm and industry level studies) reveal the actual spillover effect (changes in domestic firm's productivity) and not the changes in the industry's productivity due to the foreign presence. The findings of the meta-analysis including firm level studies only (see Table 3.5) support the original finding that: strong IP law protection has a statistically positive effect on FDI horizontal spillovers; strong public IP enforcement protection has a statistically positive effect on FDI horizontal spillovers; and their interplay has a statistically negative effect on FDI horizontal spillovers.

Table 3.5 Empirical estimation and associated marginal effects of firm – level meta-analysis ordered probit model

		Marginal effects model (1)		
	Ordered Probit Model (1)	**Significantly Negative**	**Insignificant**	**Significantly Positive**
Public IP enforcement	4.099***	-1.019279	-0.2234315	1.242711
	(4.12)	(-1.45)	(-0.92)	(1.41)
IP law protection	4.763***	-1.184314	-0.2596079	1.443921
	(4.37)	(-1.53)	(-0.96)	(1.50)

IPSS*GP	-1.005***	0.2498237	0.0547627	-0.3045864
	(-4.36)	(1.52)	(0.95)	(-1.47)
Trade openness	0.00591	-0.0014683	-0.0003219	0.0017902
	(1.75)	(-0.76)	(-0.75)	(0.78)
Tertiary education	0.0293***	-0.007275	-0.0015947	0.0088698
	(3.90)	(-1.39)	(-0.93)	(1.36)
Financial development	-0.0129***	0.0032163*	0.000705	-0.0039213*
	(-4.84)	(2.36)	(1.13)	(-2.28)
R&D	0.855**	-0.2126982	-0.0466246	0.2593228
	(3.23)	(-1.67)	(-1.14)	(1.72)
Cross sectional data	-0.355	0.0882355	0.0193417	-0.1075772
	(-0.95)	(0.40)	(0.41)	(-0.40)
Ln No. of observations	-0.0155	0.0038507	0.0008441	-0.0046948
	(-0.47)	(0.14)	(0.15)	(-0.14)
Time Span	-0.202***	0.0501616*	0.0109957	-0.0611572*
	(-5.60)	(2.40)	(1.16)	(-2.35)
Foreign presence_ Employment	-0.481**	0.1194928	0.0261935	-0.1456862
	(-3.27)	(1.37)	(0.85)	(-1.30)
Foreign presence_ equity	1.203***	-0.2991219*	-0.0655691	0.364691**
	(7.04)	(-2.48)	(-1.26)	(2.57)
Technological gap	-0.581	0.1445656	0.0316896	-0.1762552
	(-1.94)	(1.02)	(0.78)	(-1.00)
Olley-Pakes	-0.459**	0.1142123	0.0250359	-0.1392482
	(-2.90)	(1.33)	(0.97)	(-1.34)
OLS	-0.996***	0.2476675*	0.0542901	-0.3019576
	(-7.06)	(2.04)	(1.06)	(-1.95)
GMM	-0.450	0.111909	0.0245311	-0.1364401

	(-0.86)	(0.36)	(0.33)	(-0.35)
Year fixed	-0.847***	0.2106463**	0.0461748	-0.2568211**
	(-6.71)	(3.01)	(1.23)	(-2.96)
Sector fixed	0.322	-0.0801492	-0.0175691	0.0977183
	(1.68)	(-0.52)	(-0.43)	(0.50)
Publication	-0.521***	0.1295963	0.0284082	-0.1580045
	(-3.48)	(1.58)	(1.04)	(-1.58)
Amadeus	0.557**	-0.1385485	-0.0303706	0.1689191
	(2.68)	(-1.01)	(-0.74)	(0.98)
Vertical spillovers	-0.223	0.0554	0.012144	-0.067544
	(1.25)	(0.73)	(0.58)	(-0.70)
Number of observations	**1092**	**1092**		

t statistics in parentheses $^{*}p< 0.05$, $^{**}p< 0.01$, $^{***}p< 0.001$

3.6. Conclusions

Building on and extending the meta-analytical work of Meyer and Sinani (2009) and Irsova and Havranek (2013), this study examines the effect of IP systems on FDI horizontal productivity spillovers by incorporating in the theoretical and empirical framework the previously neglected element IP systems - the strength of public IP enforcement in a host country. Although the public enforcement element of IP systems has increased in importance in the years after the signing of the TRIPs agreement (Brander et al. 2017; USTR 2017), studies on FDI horizontal productivity spillovers have only considered the direct effect of the strength of IP law protection which is typically used as a proxy for the strength of IP systems overall and reported mixed results (Irsova and Havranek 2013; Smeets and de Vaal 2016; Yi et al. 2015). This study argues that the mixed empirical evidence in the existing literature may be due to overestimating the effect of IP law protection in a country and the non-consideration of the second element of IP systems, this of the strength of public IP enforcement. Both issues can introduce bias to the results of existing studies.

In this study the effect of the strength of public IP enforcement is introduced and is found that it has a direct positive effect on FDI horizontal productivity spillovers to domestic firms. Furthermore, this study finds that the levels of public IP enforcement negatively moderate the effect of IP law protection on FDI horizontal productivity spillovers. This result showcases that in countries where MNEs are able to receive strong legal protection for their IP assets and can effectively enforce their IP in case of infringement, MNEs are expected to gain strong market power in their respective industries and stifle the productivity of domestic firms. Therefore the results of the study identify two new institutional

mechanisms that were previously unknown in the literature. This has a reconciling effect with the mixed results found by previous studies, since previous studies focused on only one of the two elements that comprise the strength of IP systems, this of the strength of IP law protection. The results of the study therefore put forward the argument for the need to recalibrate the theoretical and empirical focus of future studies on FDI spillovers by considering the direct and indirect of the strength of public IP enforcement. This is especially the case for studies focusing on the effect of IP systems in the years after the signing and implementation of the TRIPs agreement which significantly altered the institutional conditions in the IP systems of WTO countries globally.

Given that the strengthening of the two elements of IP systems continuous to be an important aspect in the international policy making negotiations (e.g. the negotiations related to the formation of the Transpacific trade deal) and national policies (e.g. such as a country's IP system strategy), the results of this study have important policy implications (FT 2018). The findings in this study suggest that the strengthening of both IP law protection and public IP enforcement in a country are expected to boost FDI horizontal productivity spillovers to domestic firms. Countries such as China, where public IP enforcement is considered to be weak (Brander et al. 2017) are expected to benefit from such benefits in productivity, especially in relation to spillovers of high technological value which can help Chinese firms to legally access and exploit the IP assets of foreign MNEs. However, policy makers need to be cognizant of the potential negative impact to productivity spillovers in countries where both IP law protection and public IP enforcement are strong. It is therefore important that policy makers monitor closely the strengthening of public IP enforcement in their country and

seek to timely identify when the productivity spillovers start becoming negative and potentially intervene to avoid or overcome such problems. This can be done through the monitoring of the overall functioning of specific industries by e.g. monitoring the conditions described in the licensing contracts between MNEs and domestic firms as well as the number of IP litigations taking place within an industry and the way that the e.g. the judiciary, customs and police enforcement agents behave in cases where an MNE's allegation that its IP is infringed by a domestic firm's R&D activity is exaggerated.

APPENDIX A

Description of meta-analysis on FDI horizontal spillovers

Meta-analysis statistically integrates the results of a large set of studies on a particular topic, in one single empirical analysis and is particularly useful 'for well-established fields in which there is a high degree of agreement on the variable measures and statistical techniques' (Gaur and Kumar 2018: 281) and when multiple studies yield inconclusive or conflicting results (Meyer and Sinani 2005; Yang and Driffield 2012). The meta-analytic approach has been introduced to international business research quite recently and soon became a popular method among researchers who wish to identify patterns among empirical findings, to summarise and explain variations in results or to correct measurement and sampling errors (Meyer and Sinani 2005; Gorg and Strobl 2001).

This meta-analysis takes advantage of the extensive empirical evidence on FDI horizontal spillovers and attempts to offer an explanation for the mixed research findings in this field. Although current meta-analytic papers such as those by Gorg and Strobl (2001), Meyer and Sinani (2009), Irsova and Havranek (2013), conclude that FDI horizontal spillovers are contingent on host country characteristics such as trade openness (e.g. Irsova and Haveranek 2013; Meyer and Sinani 2009), financial development (e.g. Irsova and Haveranek 2013; Meyer and Sinani 2009), and institutional quality like intellectual property rights (IPR) (Irsova and Haveranek 2013; Havranek and Irsova 2011; Smeets and de Vaal 2011; Yi et al. 2015) only but one controls for the effect of the IP system on FDI horizontal spillovers (Irsova and Havranek 2013). Even so, this

study although it captures the strength of IP law protection in the host county, it fails to take into consideration the degree the laws are actually enforced in practise. This meta-analysis builds upon the existing meta-analyses on FDI horizontal spillovers and particularly controls for the effect of the IP system taking into consideration for the first time the distinct direct and moderating effect of the public IP enforcement (in addition to the aforementioned factors).

To develop a bias free and replicable meta-analysis this study consults the meta-analytic protocol introduced by two leading academics Stanley and Doucouliagos (2012). Table 3.6 summarizes the meta-analytic protocol suggested by Stanley and Doucouliagos (2012) and compares their processes with the ones followed for the development this meta-analysis.

Table 3.6. FDI horizontal spillovers meta-analysis protocol

Meta-analysis protocol suggested by Stanley and Doucouliagos, (2012)		**FDI horizontal spillovers meta-analysis protocol**	
Identifying studies	1. Databases such as EconLit, Proquest, Science direct, Google Scholar 2. Specify Keywords used 3. Searching in existing review articles, key primary studies on the topic, and their reference lists for relevant studies 4. Applied econometric studies – regression based estimates of an effect 5. Studies that provide the following information regression coefficients, sample	1. EconLit, Proquest, Science direct, Google Scholar 2. ‘foreign direct investment/FDI spillover*’, ‘foreign direct investment/FDI horizontal spillover*’‘productivityspillover*’, ’productivity horizontal spillover*’‘knowledge spillover*’, ‘technolog*spillover*’, ‘knowledge transfer spillover*’, ‘knowledge transfer horizontal spillover*’ 3. Meyer and Sinani (2009) and Irsova and Havranek (2013) meta-analytic studies. Crespo and Fontoura (2009) literature review. 4. Yes 5. Yes	

	size, standard errors and t-statistic.	
Inclusion criteria	1. Researcher's inclusion criteria based on the topic under investigation 2. Published studies in academic journals and unpublished papers from the NBER working papers, doctoral dissertation and departmental working papers. Unpublished papers should be routinely included in a meta-analysis unless the researchers can make a strong case that the unpublished studies are materially of lower quality.	1. Studies capturing the years 1998-2011 and be conducted in 49 specific developed and developing countries 2. Published studies in academic journal and unpublished papers from the NBER working papers, doctoral dissertation and departmental working papers have been included
Data collection		
Essential data	1. Effect sizes 2. Standard errors 3. Sample size 4. Name of authors and paper	All essential data were collected
Typical data	1. Estimation technique (cross-sectional/panel data, and firm/industry level data) 2. Country under investigation 3. Time period under investigation 4. Model specification (OLS etc.)	All typical data were collected
Effect size	1. Direct use of regression coefficients 2. Zero order correlations 3. Partial correlation 4. Elasticities 5. Semi-elasticities 6. t-statistics	For this study the t-statistic is selected as the effect size

A three step approach was followed in the process of selecting the most appropriate primary literature and establishing a comprehensive database for this study. First, four computerized databases namely Proquest, Science direct, EconLit and the scientific search engine Google Scholar are examined. In line with the keywords used by Meyer and Sinani (2009), a combination of the search terms 'foreign direct investment/FDI spillover*', 'foreign direct investment/FDI horizontal spillover*''productivityspillover*','productivity horizontal spillover*''knowledge spillover*', 'technolog*spillover*', 'knowledge transfer spillover*', 'knowledge transfer horizontal spillover*' is used to search in the titles and abstracts of studies included in these databases. Second, relevant FDI horizontal spillover studies (published and unpublished) are identified in the reference lists of the two previous meta-analytical studies by Meyer and Sinani (2009) and Irsova and Havranek(2013) and in the review paper of Crespo and Fontoura (2009).These two stages yield 112 studies on FDI horizontal spillovers. In the third stage the inclusion criteria are set, being; (1) the studies on FDI horizontal spillovers should be applied econometric studies, (2) empirical studies should report information about regression coefficients, sample size, standard errors and t-statistics, (3) studies investigation time period should capture the years 1998-2011 and (4) studies should investigate 49 specific developed and developing countries. Criteria 3 and 4 were developed because the scores of the main independent variable that used to approximate for the strength of public IP enforcement, the international patent systems strength index (IPSS) by Papageorgiadis et al. (2014), is available for this specific time period and country range. Having set the inclusion criteria the sample reduced to 49 published and unpublished

empirical papers on FDI horizontal spillovers. From the 49 studies, 29 studies were identified from searching the databases and 20 identified in the reference lists of the two previous meta-analytical studies by Meyer and Sinani (2009) and Irsova and Havranek(2013).At the last stage the primary researcher (Ph.D candidate) read the 49 articles and extracted data on the variables of interest, including outcome statistics, sample sizes, statistical artifacts, study characteristics and also collected the data for the country level variables such as trade openness, tertiary education, R&D expenditures and financial development. To ensure an error-free dataset, the other three researchers (Ph.D candidate's supervisors) inspected the final dataset.

CHAPTER 4

THE EFFECT OF PUBLIC IP ENFORCEMENT ON FDI VERTICAL SPILLOVERS

4.1. Introduction

This study examines the effect of IP systems on FDI vertical spillovers paying particular attention to the role and importance of public IP enforcement. FDI vertical spillovers refer to the case where domestic firms and MNEs' foreign affiliates operate in different industries (Liu et al. 2009) and mainly take place via the transfer of advanced knowledge from the MNEs' foreign affiliates to their domestic suppliers/buyers (Blalock and Simon 2009). MNEs do this as in the long run it allows them to benefit from improved end products/services by their suppliers or increased sales and improved distribution networks (Blalock and Simon 2009). It is therefore anticipated that domestic suppliers and buyers who acquire and effectively utilise MNEs' advanced technological and managerial know-how to experience an increase in their productivity resulting in positive FDI vertical spillovers (Gorg and Greenaway 2003).

As both foreign and domestic firms are obliged to operate under a specific institutional setting, institutions in the host country (among other factors) can shape the choices, behaviour, interaction and performance of foreign and domestic firms (Meyer and Sinani 2009; Smeets and de Vaal 2016; Yi et al. 2015). The IP system of the host country, as one aspect of the institutional environment, could influence the FDI vertical spillovers that advantage domestic suppliers and buyers. This is because strong IP systems reduce MNEs'

transaction costs (information, monitoring and enforcement) in the host country and allow for the safer exploitation of their IP assets (ownership advantage) (Yi et al. 2015). Reduced transaction costs increase the attractiveness of the host country and thus the number of foreign affiliates, promote the transfer of technologically advanced assets from the MNEs to their foreign affiliates, encourage investment in R&D activities and increase the possibility of licensing IPs to domestic firms in upstream and downstream industries (Branstetter et al. 2007; de Faria and Sofka 2010; Javorcik 2004). A MNEs decision to transfer high quality knowledge and engage in innovative activities in the host country, allows for the authorised transfer or unauthorised leakage, of advanced IPs to the domestic suppliers and buyers which could potential increase their productivity.

As discussed extensively in Chapter 3, despite the importance of the host country's public IP enforcement and IP system in IB research (Arora 2009; Maskus 2000; Peng et al. 2017a) few studies control for the effect of IP systems on FDI horizontal and vertical spillovers (Havranek and Irsova 2011; Smeets and de Vaal 2016). To date, only two studies examined the effect of IP systems on FDI vertical spillovers. Havranek and Irsova (2011) adopting a meta-analysis found an insignificant relationship between stronger IP systems and FDI vertical spillovers. However, Smeets and de Vaal (2016) found a positive relationship between stronger IP systems and FDI backward spillovers buta negative one with FDI forward spillovers. However the aforementioned studies do not theoretically distinguish nor empirically examine the IP system as having two pillars, i.e. IP law protection and public IP enforcement (see Havranek and Irsova 2011; Smeets and de Vaal 2016). Rather they assume

that countries with strong IP law protection are accompanied by effective public IP enforcement (Havranek and Irsova 2011; Smeets and de Vaal 2016), which as the WTO points out is not always the case. So, although existing studies intend to capture the overall effect of the IP system on FDI vertical spillovers, they only capture the effect of IP law protection but not the effect of public IP enforcement. From the discussion so far, it is evident that the distinct effect of the public IP enforcement has not been accounted for in previous FDI vertical spillovers studies.

This study sets out to address **RQ2** and fill the aforementioned research gap. In doing so it makes the following two contributions to the existing literature. First by taking into consideration the distinct effect of the public IP enforcement it becomes the first to conceptualise and test for the overall effect of the IP system on FDI vertical spillovers (i.e. IP law protection and public IP enforcement). It does so, by building upon and extending Havranek and Irsova's (2011) meta-analytical study on FDI vertical spillovers. To test for the distinct effect of the public IP enforcement on FDI vertical spillovers, the newly developed international patent systems strength index (IPSS) (Papageorgiadis et al. 2014) is employed. The results obtained indicate that the strength of public IP enforcement in a country has a direct positive effect on the productivity of domestic suppliers and buyers. This finding also potentially explains the insignificant relationship found by Havranek and Irsova (2011) as they have not taken into consideration the degree to which IP laws are actually enforced.

Second, this study explores another uncharted area in the literature, the moderating effect of the stronger public IP enforcement on the relationship between strong IP law protection and FDI vertical spillovers. The results

suggest that the public IP enforcement negatively moderates the effect of strong IP law protection on FDI vertical spillovers. This means that stronger IP law protection and stronger levels of public IP enforcement, come at the expense of domestic suppliers and buyers as they allow MNEs to improve and consolidate their monopolistic power resulting in blocking competition, attracting market demand, and being able to charge premium prices (Aitken and Harrison 1999; Smeets and de Vaal 2016). This result supports the view of those scholars who assert it is imperative to consider the effects of both IP law protection and IP enforcement element of IP systems systematically (Arora 2009; Maskus 2000; Peng et al. 2017a).

4.2. Hypotheses development

To date, much research has been done on the positive externalities of inward FDI suggesting that it benefits the host country by generating spillovers to the rest of the domestic firms (Crespo and Fontoura 2009; Gorg and Greenaway 2003; Meyer and Sinani 2009; Liu et al. 2009). Such research implies that there is potential for domestic firms' productivity to be affected by the foreign presence in the host country and generate positive FDI horizontal and vertical spillovers. In this study, the focus is on the FDI vertical spillovers which refer to the case where domestic firms and MNEs' foreign affiliates operate in different industries and are divided into backward and forward spillovers (Liu et al. 2009). FDI backward spillovers arise when domestic firms supply the foreign affiliates with goods and services from the upstream industries and FDI forward spillovers arise when foreign affiliates sell goods and services to the domestic

firms (Liu et al. 2009).[15]This chapter aims to investigate the effect of IP law protection, public IP enforcement and the moderating effect of public IP enforcement on the productivity of domestic suppliers and buyers. First a brief background on the different channels through which MNEs' foreign affiliates affect domestic suppliers and buyers is presented followed by the hypotheses development section.

4.2.1. FDI backward spillovers

Regarding the FDI backward spillovers, Javorcik (2004) argues that MNEs have no incentive to prevent knowledge and technology transfer to their suppliers as they may benefit from improved quality and performance of intermediate inputs. Knowledge transfer from MNEs' foreign affiliates to domestic suppliers can take place in the following ways: (1) by providing technical assistance to raise the quality of the products/services and facilitate innovation; (2) by offering advice and help on how to build or upgrade production capabilities and processes; (3) by providing managerial training (Lin et al. 2009; Javorcik 2004; Blalock and Gertler 2007). Apart from the direct knowledge transfer, domestic suppliers can also indirectly benefit from the foreign presence. The arrival of foreign affiliates in the host country increases the demand for downstream industry products, hence the competition among domestic suppliers. Due to the fact that the quality and delivery standards of foreign affiliates are high, domestic suppliers are motivated to upgrade their practices in order to win contracts with the foreign affiliates (Blalock and Simon 2009; Javorcik 2004). The upgrade of their production and delivery processes in order to match the demanding needs of

[15]The upstream stage of the production process involves searching for and extracting raw materials. For instance firms operating in the upstream stage of the petroleum industry locate and extract oil reserves which they later sell on to other companies.

the MNEs can result, first in winning more contracts with the MNEs and second becoming more efficient, all together leading to experiencing positive changes in their productivity (Blalock and Simon 2009; Javorcik 2004).

So far the majority of empirical studies point to a positive relationship between the foreign presence and FDI backward spillovers. For instance, Blalock and Gertler (2003) for Indonesia, Kugler (2001) for Colombia, Javorcik (2004) for Lithuania and Du et al. (2012) for China all find evidence for positive FDI backward spillovers, but Laenarts and Merlevede (2011) for Romania and Xu and Sheng (2012) for China find this relationship insignificant.

There are growing suspicions regarding the positive effects of backward linkages (Liu et al. 2009; Lin and Saggi 2005). First, MNEs foreign affiliates may have incentives to minimise the direct knowledge transfer to their domestic suppliers (Lin et al. 2009). This is so because domestic suppliers in the host country co-operate with a number of foreign and domestic firms, and potentially act as mediators by intentionally or unintentionally transferring knowledge from one firm (foreign affiliates) to another (foreign affiliates' competitors) (Spencer 2008). Domestic suppliers that have been educated by the foreign affiliates (training of employees, management practices, production processes etc.) and have been exposed to foreign affiliates' high quality standards and processes, can pass their newfound knowledge onto other clients i.e. domestic firms that can be foreign affiliates' direct competitors (Spencer 2008). In such cases MNEs respond in two ways. MNEs may require their domestic suppliers to cease supplying other downstream firms in order to minimise any intentional or unintentional knowledge leakages, as a condition of transferring their advanced knowledge (Lin et al. 2009). Alternatively, MNEs may develop binding contracts

specifying the legal boundaries inside which domestic suppliers can legally use and exploit MNEs advanced knowledge, restricting the transfer of their knowledge to unauthorised parties. In such cases domestic suppliers are dependent upon MNEs' purchases and alternative means of obtaining profit may be limited resulting in a potential decline in performance. Second, competition among domestic suppliers on who will win a contract with the MNEs may also have an adverse effect. Domestic suppliers that are more innovative or possess greater capabilities and better match MNEs' high quality standards, may attract demand away from relatively less knowledge intensive domestic suppliers resulting for the later to experience a decrease in their performance and productivity.

4.2.2. FDI forward spillovers

FDI forward spillovers may take place via two channels. First, it is generally accepted that foreign affiliates are more innovative than domestic firms as they most often possess advanced technological and managerial know-how (Smeets and de Vaal 2016). Domestic buyers by interacting/co-operating with the foreign affiliates, or by just using their superior quality outputs, are exposed to advanced knowledge and practices. For domestic buyers with sufficient absorptive capacity, the incorporation of MNEs' products/knowledge into their practices can help increase their products' quality, processes, efficiency resulting altogether in improved productivity (Driffield et al. 2002; Smeets and de Vaal 2016). Second, as foreign affiliates are more innovative than domestic firms they can offer higher quality products and intensify competition in the industry, which is likely to crowd out some of the domestic competitors (competition effect see Aitken and Harrison (1999)) resulting in more domestic

firms in downstream industries buying their inputs (Smeets and de Vaal 2016). As foreign affiliates can utilise the advantages of economies of scale, they may offer their products at lower prices. By purchasing inputs at lower prices than before, domestic buyers may increase their profitability and may allocate their monetary surplus to innovative activities that could potentially increase their productivity and performance (Smeets and de Vaal 2016).

Research on the effect of foreign presence on FDI vertical spillovers, although relatively limited in comparison to horizontal spillovers, points to a positive relationship. For example, Driffield et al. (2002) and Fu (2012) for the UK and Du et al. (2012) for China, find evidence for positive FDI forward spillovers, while Laenarts and Merlevede (2011) for Romania and Xu and Sheng (2012) for China find this relationship insignificant.

Despite the importance of the host country's public IP enforcement and IP system in IB research (Arora 2009; Maskus 2000; Peng et al. 2017a) only a few studies control for the effect of the IP system in FDI vertical spillovers (Havranek and Irsova 2011; Smeets and de Vaal 2016). Havranek and Irsova (2011) adopt a meta-analysis approach covering 57 empirical studies to examine which factors, including IP systems, influence the magnitude of FDI vertical spillovers. Their findings show an insignificant relationship between the strength of IP systems and FDI vertical spillovers. Smeets and de Vaal (2016) employ a large dataset comprising 81,299 firms in 17 countries and find that strong IP systems strengthen backward linkage effects but weaken forward linkage effects. However, it is possible the results of these aforementioned studies lack reliability. This is so because although these studies intended to capture the overall effect of the IP system on FDI vertical spillovers, they

conceptualised and tested only for the strength of the IP law protection without controlling for the effectiveness of the public IP enforcement element. To be exact these studies employed the index of patent protection by Ginarte and Park (1997) and Park (2008) to approximate for the strength of the IP systems as a whole. This index though, does not include a measurement for patent enforcement (Fosfuri 2004; Javorcick 2004; Nicholson 2007; Nunnenkamp and Spatz 2004; Papageorgiadis et al. 2014) as it is only 'designed to provide an indicator of the strength of patent protection and not the quality of patent systems (Park 2008:761). However, as has been pointed out in respect to the strength of an IP system, 'the real issue is whether a country adequately enforces the laws and regulations it has in place' (Maskus 2004:22); as it is the strong public IP enforcement that ensures IP dependent MNEs that their rights will not only be granted but upheld in case of violation. This reassurance motivates MNEs to invest in FDI, transfer knowledge-intensive assets to their foreign affiliates and domestic suppliers and buyers, which can potentially increase domestic firms' productivity. From the discussion so far, it is evident that the distinct effect of the public IP enforcement has not yet been accounted for in previous FDI vertical spillovers studies regardless of its paramount importance.

4.2.3. IP law protection and FDI vertical spillovers

It is established in the literature that strong IP law protection opens up countries to receive more inflows of technologically intensive FDI (Awokose and Yin 2010; Berry 2017; Branstetter et al. 2007). According to institutional theory, strong formal institutions clearly specify the legal boundaries inside which MNEs and domestic firms can pursue their activities (North 1992). Strong IP law protection

in the host country is positively perceived by the MNEs as it provides the legal boundaries inside which MNEs can register, legally protect and potentially enforce their IP assets and advanced technological and managerial know-how (Khoury et al. 2014; Yi et al. 2015). As such, under strong IP law protection, the amount of inward FDI increases and consequently the number of foreign firms in the market. Moreover, since strong IP law allows MNEs to register their IP in the host country, MNEs incorporate advanced codified knowledge in their practice and products used/sold in the host market. Based on these conditions, domestic suppliers can benefit from stronger IP law protection using legal but also illegal means.

First the high volume of foreign affiliates increases the opportunities for domestic suppliers to co-operate with the foreign affiliates. The increased number of foreign affiliates in the market increases the demand for downstream industry products and as such domestic suppliers may gain more customers (MNEs), increase their sales and thus experience improved performance. In addition domestic suppliers by co-operating with the MNEs, are exposed to a variety of advanced practices and knowledge that if adopted and incorporated into their own practices could increase the quality of their processes/products resulting in increasing their productivity. However as transaction cost theory posits, when specific assets are transacted frequently, MNEs' monitoring and enforcement costs may increase as they need to be constantly aware of the other contracting party's activities. Although strong IP law protection allows MNEs to draw strict contracts with their suppliers forbidding them any unauthorised transfer of their shared IP, it does not restrict the opportunistic behaviour of domestic suppliers to illegally share or sell the knowledge acquired

through their co-operation with the MNEs to other firms which may be the foreign affiliates' competitors (Lin et al. 2009), if the public IP enforcement is absent or low. Even if MNEs become more reluctant in directly sharing their knowledge with their domestic suppliers, due to the public good nature of knowledge domestic suppliers can still get access to MNEs' advanced practices and products.

Second, as stronger IP law protection allows MNEs to register their IPs in the host country, MNEs will be more likely to use IPs in production of their products. Also, MNEs will require high quality inputs that can be used in conjunction with their advanced IP. Domestic suppliers aiming to outdo domestic competition will need to offer high quality outputs that meet MNEs standards. Thus, domestic suppliers may attempt to increase the quality of their outputs by taking advantage of the strong IP law protection in the country and engaging in R&D activities. The benefit here is twofold. First by engaging in R&D activities they can improve their own processes, practices and capabilities resulting in becoming more efficient and effective and increasing their performance. Second, high quality products will be preferred and purchased by the MNEs resulting in increased sales and thus productivity.

Third, it is generally accepted that foreign affiliates are more innovative than domestic firms as they most often possess advanced technological and managerial know-how (Smeets and de Vaal 2016). A strong IP law protection framework in the host country that allows MNEs to register and protect their IP, may reinforce their competitive position resulting in crowding out of some of the domestic competitors (see competition effect in Aitken and Harrison (1999)). As such some domestic buyers may end up being supplied by MNEs' affiliates

rather than domestic firms (Smeets and de Vaal 2016). As foreign affiliates can utilise the advantages of economies of scale and offer their products at lower prices, domestic buyers' expenses decrease and can invest their surplus to improve the quality of their outputs, satisfy their customers' needs and increase their sales and thus productivity. In addition, since strong IP law protection allows for the register of MNEs' IP in the host country, their outputs will be of better quality than those produced by domestic firms. As such, domestic buyers purchasing MNEs' products will be exposed to higher quality inputs which, if incorporated into their practices and processes, could improve their efficiency and quality resulting in better productivity.

Hypothesis 1: *The strength of IP law protection in a country positively affects the FDI backward productivity spillovers*

Hypothesis 2: *The strength of IP law protection in a country positively affects the FDI forward productivity spillovers.*

4.2.4. Public IP enforcement and FDI vertical spillovers

Apart from increasing the attractiveness of the host country, strong public IP enforcement in a host country can influence the direct knowledge transfer channels influencing FDI vertical spillovers. The literature suggests that strong public IP enforcement promotes the transfer of high quality knowledge from the MNEs to their foreign affiliates, increases the patenting activity of foreign affiliates and increasing investment in high value MNE activities, such as the establishment of R&D centres (Branstetter et al. 2007; Berry 2017; Maskus et al. 2003). This is because high levels of public IP enforcement reinforce the location advantage of the host country and reduce MNEs' transaction costs by

allowing them to effectively defend their IP in case of violation. In such cases strong public IP enforcement allows MNEs to engage with the relevant public enforcement agents (police, customs, judiciary) seize and prosecute the infringers and halt the unauthorised exploitation of their IP assets, preserving their ownership advantage (Keupp et al. 2010; Yang et al. 2008).

As aforementioned, foreign affiliates have incentives to promote direct knowledge transfer to their domestic suppliers as they can benefit from improved quality of inputs purchased. However, foreign affiliates also have incentives to minimise the direct knowledge transfer to their domestic suppliers (Lin et al. 2009), as these domestic suppliers may intentionally or unintentionally transfer a proportion of their acquired knowledge to their other buyers, who may also be the foreign affiliates' competitors (Lin et al. 2009). Strong public IP enforcement minimises the opportunistic behaviour of domestic suppliers to share MNEs' knowledge by allowing for the enforcement of binding contracts that prevent domestic suppliers from sharing the accumulated knowledge with unauthorised third parties or applying the knowledge in forward relationships with other buyers (Smeets and de Vaal 2016). Most importantly stronger levels of public IP enforcement allow foreign affiliates to enforce IP laws where expropriation occurs. In the case of contract violation, MNEs engaging with the public enforcement agents can seize the infringers, halt the unauthorised use of their knowledge and take the case to the judiciary through IP litigation (Papageorgiadis et al. 2014). Moreover, the fact that domestic suppliers may find themselves involved in protracted and costly court trials ending up in losing market opportunities and brand reputation, may discourage them from the unauthorised use or diffusion of foreign affiliates' knowledge and IP. Thus,

strong public IP enforcement decreases MNEs' monitoring and enforcement and increases the incentives of MNEs to enter into more contractual agreements with the domestic suppliers and directly transfer advanced technological and managerial know-how. As strong public IP enforcement also increases the amount and quality of IP assets and know-how transferred from MNEs to their foreign affiliates (Berry 2017), the knowledge transferred to MNEs' domestic suppliers is expected to be of higher quality achieved, for example, through technical assistance, production processes advises and managerial training. Therefore domestic suppliers with sufficient absorptive capacity that are able to adopt and effectively utilise foreign affiliates' advanced knowledge, can improve the quality and efficiency of their products and processes resulting in increased sales, improved performance, processes and thus productivity.

Similarly, since strong public IP enforcement increases the quality of knowledge transferred from the MNEs to foreign affiliates and the patenting activity of foreign affiliates, the end products developed by the foreign affiliates are expected to incorporate advanced technological and managerial know-how. The purchase of such inputs by the domestic buyers for use in their processes/products can result in becoming more effective and efficient (costs reduction) and/or increasing the attractiveness of their products (increase in sales) (Smeets and de Vaal 2016).

Hypothesis 3: *The strength of public IP enforcement in a country positively affects the FDI backward productivity spillovers*

Hypothesis 4: *The strength of public IP enforcement in a country positively affects the FDI forward productivity spillovers.*

4.2.5. The effect of IP enforcement on the relationship between IP law protection and FDI vertical spillovers

While strong IP law protection and strong public IP enforcement individually are expected to benefit the productivity of domestic suppliers and buyers, their joint effect has the potential to provide strong market power to foreign affiliates and negatively impact FDI vertical spillovers.

Strong IP law protection accompanied by strong enforceability of the laws in the host country minimises MNEs contracting, monitoring and enforcement costs by allowing them to register and also enforce their rights if a violating act occurs. This reduces the opportunistic behaviour of domestic suppliers and buyers to misappropriate the asset under transaction. A strong IP system gives incentives to MNEs to develop more innovative IP in the host country or transfer it from their home country, as it assures them that their rights will not only be granted but also upheld in case of violation. The development/transfer of state of the art technology/IP improves and consolidates MNEs monopolistic power (ownership advantage) in the host market, resulting in blocking competition, attracting market demand away from domestic competitors, while allowing them to charge premium prices (Aitken and Harrison 1999; Smeets and de Vaal 2016). Domestic competitors that do not possess similar capabilities or competitive power, may be forced out of the market or confined to market segments that foreign affiliates are not interested in serving. Accordingly, as the number of MNEs' domestic competitors reduces, domestic suppliers lose potential

customers making them increasingly reliant on the foreign affiliates. As the bargaining power of domestic suppliers decreases, foreign affiliates capitalising on their monopolistic position may apply pressure on the domestic suppliers to reduce their prices. As such profitability and consequently productivity of domestic suppliers may decline.

Similarly, as the number of MNEs' domestic competitors decrease as a result of the strengthening of the IP system, the number of alternative input suppliers decreases for the domestic buyers. Therefore domestic buyers become more dependent on the foreign affiliates to purchase their inputs. The high quality of their products coupled with the increased bargaining power over domestic buyers, allow MNEs to charge higher prices for their outputs (Smeets and de Vaal 2016) resulting in a decrease in domestic buyers' productivity.

Hypothesis 5: *The strength of public IP enforcement in a country negatively moderates the relationship between stronger IP law protection and FDI backward spillovers.*

Hypothesis 6: *The strength of public IP enforcement in a country negatively moderates the relationship between stronger IP law protection and FDI forward spillovers.*

4.3. Data and Methods

To investigate the effect of strong IP law protection and strong public IP enforcement on FDI backward and forward spillovers, the same methodological approach as in Chapter 3 i.e. a meta-analysis and the ordered probit model is adopted (see Chapter 3, section 4 for more information and Appendix A).

4.3.1. Selection of primary literature

In order to identify the most appropriate primary literature and establish a comprehensive database for this study a three step approach was followed. Similar to Chapter 3, FDI vertical spillover studies should capture the years 1998-2011 and been conducted in 49 specific developed and developing countries. This is because the scores of the main independent variable used to approximate for the strength of public IP enforcement, the international patent systems strength index (IPSS) by Papageorgiadis et al. (2014), is available for this specific time period and country range. Second, 16 relevant FDI spillover studies (published and unpublished) identified in the reference list of the previous meta-analytical study by Havranek and Irsova (2011). Third, with the use of keywords three established scientific databases (Proquest, Science direct, EconLit databases) and the scientific search engine Google Scholar were searched. In line with the keywords used by Meyer and Sinani (2009), a combination of the search terms ‘foreign direct investment/FDI spillovers’, ‘foreign direct investment/FDI vertical spillovers’, ‘foreign direct investment/FDI backward spillovers’, ‘foreign direct investment/FDI forward spillovers’, ‘productivity spillovers’, ‘productivity vertical spillovers’, ‘productivity backward spillovers’, ‘productivity forward spillovers’, ‘knowledge spillovers’ and

'technolog* spillovers' was used to search in the titles and abstracts of studies included in these databases. This search allowed for identification of 11 additional studies. Therefore, the final dataset encompasses 27 published and unpublished empirical papers on FDI vertical spillovers. Table 4.1 provides a summary of the characteristics of each of the studies that are included in the dataset, in terms of the country of focus, the year studied and the level of focus of each study. It is important to note that this dataset takes into consideration the multiple FDI vertical spillover estimates the 27 studies report, which enables the analysis of the data as a panel.[16]

Table 4.1 The empirical studies on FDI vertical spillovers included in the meta-analysis

Study	Country	Data year	Aggregation
Du et al. (2012)	China	1998-2007	Firmlevel
Jordaan (2013)	Mexico	2000-2001	Firm level
Fu (2012)	UK	1998-2004	Firm level
Javorcik and Spatareanu (2011)	Romania	1998-2003	Firm level
Jeon et al. (2013)	China	1998-2007	Firm level
Liu et al. (2009)	China	1998-2001	Firm level
Reganati and Sica (2007)	Italy	1997-2002	Firm level
Merlevede et al. (2014)	Romania	1996-2005	Industry level
Kolasa (2008)	Poland	1996-2003	Firm level

[16] An identical meta-analytic protocol to the one followed in Chapter 3 was used in the development of the FDI vertical spillover meta-analysis (see Chapter 3 Appendix A for more information).

Merlevede and Schoors (2007)	Romania	1996-2001	Firm level
Merlevede and Schoors (2009)	Romania	1996-2001	Firm level
Gersl et al. (2008)	Czech republic, Hungary, Poland, Slovakia, Romania	2000-2005	Industry level
Laenarts and Merlevede (2011)	Romania	1996-2005	Firm level
Mariotti et al. (2011)	Italy	1999-2005	Firm level
Nicolini and Resmini (2010)	Poland	1998-2003	Firm level
Xu and Sheng (2012)	China	2000-2003	Industry level
Tomohara and Yokota (2006)	Thailand	1999-2001	Firm level
Blake et al. (2009)	China	2000	Firm level
Crespo et al. (2009)	Portugal	1996-2000	Firm level
Geršl (2008)	Czech Republic	2002-2005	Firm level
Girma and Gong (2008)	China	1999-2002	Firm level
Halpern and Muraközy (2007)	Hungary	1996-2003	Firm level
Javorcik and Spatareanu (2008)	Romania	1998-2003	Firm level
Lin et al. (2009)	China	1998-2005	Firm level
Qiu et al. (2009)	China	2001-2006	Industry level

Wang and Zhao (2008)	China	2000-2002	Industry level
Chang et al. (2007)	China	2002-2005	Firm level
Schoors and van der Tol (2002)	Hungary	1997-1998	Firm level

4.3.2. Effect size and estimation method

As in Chapter 3 in this meta-analysis t-statistics are used for the construction of the dependent variable and used to calculate the p values (statistical significance) of study estimates, distinguishing between backward and forward FDI spillovers to avoid violating the first property of the effect sizes (i.e. the effect size should measure the effect of one variable on another holding other factors constant (Stanley and Doucouliagos 2012). As such backward FDI spillovers are distinguished between significantly negative, insignificant and significantly positive estimates using a categorical effect size as the dependent variables. The classes are labelled 0, 1, 2 respectively adopting a significance level of 5%. The same classification applies for the forward FDI spillovers. As in Chapter 3 the ordered probit model is applied but because the estimated coefficients from an ordered probit model should not be used for inference the marginal effects are also calculated (Verbeek 2017).[17]

Specifically, the model assumes the presence of a latent variable yb_{ij}^{*} (backward spillovers) and yf_{ij}^{*} (forward spillovers) that is explained by the

[17] For more information see Chapter 3, section 3.

moderators explained below. The model for backward and forward spillovers respectively is as follows:

$$yb_{ij}^{*} = \sum_{k=1}^{22} \beta_k Z_{k,ij} + \varepsilon_{ij}$$

$$yf_{ij}^{*} = \sum_{k=1}^{22} \beta_k Z_{k,ij} + \varepsilon_{ij}$$

Whereyb_{ij}^{*} and yf_{ij}^{*} are unobservable and ε_{ij} is the error term that is normally and *iid* distributed. $Z_{k,ij}$ refer to the independent variables and the proxy for yb_{ij}^{*} and $yf_{ij}^{*}$is the latent variable y_{ij}, constructed as follows:

Category A: *y*=0 if estimate is statistically significant negative

Category B: *y*=1 if estimate is insignificant (either negative or positive)

Category C: *y*=2 if estimate is statistically significant positive

4.3.3. Independent variables

The two variables of interests are the IPSS index as a proxy of the public IP enforcement and Park (2008) index as a proxy of the IP law protection, and a detailed description can be found in Chapter 3 (section 3.4.).

4.3.4. Country level variables

Three country level variables that are theoretically expected to have a positive effect on the productivity of domestic suppliers and buyers are included, namely: i) financial development, ii) labour quality, and iii) trade openness (as an indicator of technological inflows in host country) (Wooster and Diebel 2010; Solow 1999).

In terms of the host country's financial development, domestic suppliers that have access to financial capital can invest in the development of technologically advanced intermediate goods that will be preferred and purchased by the foreign affiliates (Havranek and Irsove 2011; Smeets and de Vaal 2016). Thereof domestic suppliers in countries with well-developed financial system are more likely to experience positive changes in their productivity. Along the same lines, domestic buyers that have access to financial capital are able to purchase technologically advanced goods by the foreign affiliates become exposed to the advanced and high-quality end products and experience positive changes in productivity (Havranek and Irsova 2011; Smeets and de Vaal 2016).

Advanced human capital enables domestic suppliers to acquire and develop capabilities that can increase their absorptive capacity (Meyer and Sinani 2009) and thus produce technologically advanced intermediate goods that can be purchased by the foreign affiliates. Moreover, advanced human capital also increases the absorptive capacity of the domestic buyers and enables them to successfully utilize intermediate goods purchased by the foreign affiliates. As in the majority of the FDI spillover studies the level of tertiary education in host country and the R&D expenditures of the private sector to proxy for the human capital are included in this model (Irsova and Havranek 2013; Meyer and Sinani 2009).

In respect to the trade openness of the host country, domestic suppliers that are exposed to international trade and thus to international competition are more likely to have the knowledge and the skills to produce technologically advanced intermediate goods that foreign affiliates in the host country most often require (Havranek and Irsova 2011). However, there is the possibility that such

technologically advanced intermediate goods to be relatively expensive. A country open to trade provides the opportunity to foreign affiliates to import their necessary intermediate goods from other countries at lower prices (Havranek and Irsova 2011). As such domestic suppliers may be found in a competitive disadvantaged position and experience negative changes in their productivity. This study therefore controls for the effect of trade openness on backward FDI spillover. Regarding the domestic buyers that trade internationally, they are exposed to advanced knowledge and technology which can adopt and adapt in their own practices and processes (Havranek and Irsova 2011). As such they can adequately exploit the technologically advanced inputs purchased by the foreign affiliates and produce high quality end products increasing their productivity. Table 4.2 below provides the definition of all the variables included in the study and the data sources used to measure them.

Table 4.2 Definition of variables and sources of data

Variable	Definition	Data source
$\mathbf{CB_{sig}}$	Categorical backward dependent variable: =0 if spillover estimates are negative, =1 if spillover estimates are insignificant, =2 if spillover estimates are positive	
$\mathbf{CF_{sig}}$	Categorical forward dependent variable: =0 if spillover estimates are negative, =1 if spillover estimates are insignificant, =2 if spillover estimates are positive	
IP law protection	Park (2008) patent protection index The index ranges from 0 to 5 with higher values	Park (2008)

	indicating stronger levels of patent protection.	
Public IP enforcement	Papageorgiadis et al., (2014) IPSS index The index ranges from 0 to 10 with higher scores indicating stronger enforcement levels	Papageorgiadis et al., (2014)
Country level variables		
Trade openness	Trade (%GDP)	World bank - World Development Indicators
Tertiary education	The tertiary school enrolment rate in the country	World bank - World Development Indicators
R&D	R&D expenditures (%GDP)	World bank - World Development Indicators
Financial development	Domestic credit provided by financial sector (% of GDP)	World bank - World Development Indicators
Data characteristics		
Cross sectional data	= 1 if cross sectional are used, = 0, otherwise	
Industry level data	= 1 if industry level data are used, = 0, otherwise	
No. of observations	The number of observations used in each study	
Time span	The number of years of the data used	
Specification characteristics		
Foreign presence in employment	=1 if proxy for foreign presence is measured in terms of employment share, = 0, otherwise	
Foreign presence in equity	=1 if proxy for foreign presence is measured in terms of equity share, = 0, otherwise	
Technological gap	=1 if the study controls for technological gap, = 0, otherwise	
Horizontal spillovers	=1 if horizontal spillovers are included in the regression, =0, otherwise	
Estimation characteristics		
Olley-Pakes	=1 if the Olley-Pakes	

	method is used for the estimation of total factor productivity, =0 otherwise
OLS	=1 if the Ordinary Least Squares method is used for the estimation of total factor productivity, =0 otherwise
GMM	=1 if the system General Method of Moments estimator is used for the estimation of spillovers, =0 otherwise
Year fixed	=1 if year fixed effects are included, =0 otherwise
Sector fixed	=1 if sector fixed effects are included, =0 otherwise
Publication characteristics	
Amadeus	=1 if the Amadeus database is used, =0 otherwise
Publication	=1 if paper published in a peer reviewed journal, =0 otherwise

4.3.5. Control variables

As explained extensively in Chapter 3 (section 4) this meta-analytic model creates a number of dummy variables to control for study, model specification, estimation and publication characteristics. The only different variable in this model is the FDI horizontal spillovers variable. This study creates a dummy variable for studies that measure FDI horizontal spillovers in the same regression with FDI vertical spillovers.

4.4. Results and Discussion

Table 4.3 provides the descriptive statistics of all the variables included in the empirical estimation and Tables 4.4 and 4.5 presents the ordered probit estimates and associated marginal effects for the FDI backward and forward spillovers respectively.

The majority of existing empirical evidence on FDI vertical spillover concludes that in the absence of a competition effect, the presence of foreign affiliates in upstream and downstream industries is likely to have a positive effect on domestic suppliers and buyers' productivity. The findings of this study support the theoretical predictions as they identify how in cases where only one pillar of the IP system is strong (either IP law protection or public IP enforcement) MNEs do not outcompete domestic firms and domestic suppliers and buyers are positively influenced by the foreign presence. However, when the IP system becomes stronger and both IP law protection and enforcement are strong, MNEs gain a near monopolistic position in the market resulting in the occurrence of negative FDI vertical spillovers.

The results of this analysis provide support for the central proposition of this study that the strength of public IP enforcement element of IP systems has a direct separate effect on FDI backward and forward spillovers. Specifically, and in relation to Hypotheses 1 and 2, the coefficient of the IP law protection is positive and statistically significant for FDI backward (0.1444, $p<0.001$) and forward spillovers (0.148, $p<0.001$) suggesting that stronger IP law protection has a positive impact on the productivity of domestic suppliers and buyers. The finding of Hypothesis 1 is in line with Smeets and de Vaal (2016) who find a

positive relationship between stronger IP law protection and FDI backward spillovers, but in contrast to Havranek and Irsova (2011) who find an insignificant relationship. This result suggests that stronger IP law creates more opportunities for the domestic suppliers and buyers to co-operate with a foreign affiliate to increase sales. Moreover, as domestic suppliers co-operate more with the foreign affiliates, they are exposed to advanced knowledge and practices that if incorporated into their own practices could increase the quality of their processes/products resulting in increased productivity. The results also support Hypothesis 2 but are not in line with Smeets and de Vaal (2016) who identified a negative relationship between stronger IP law protection and the productivity of domestic buyers and Havranek and Irsova (2011) who found an insignificant one. This study's results suggest that stronger IP law protection increases the number of foreign affiliates in the market, creating alternatives for domestic buyers to obtain their inputs at lower prices. Moreover, since strong IP law protection allows MNEs to register their IP in the host country, their end products will encompass advance knowledge and practices that can improve the efficiency and quality of domestic buyers' processes/products. The ambiguity between this study's research findings and those of Havranek and Irsova (2011) and Smeets and de Vaal (2016) might have arisen because of their incomplete conceptualisation and testing of the IP system. Although the authors intended to capture the effect of the strength of the overall IP system in a host country, both failed to take into consideration the strength of public IP enforcement. However, as it becomes evident in the testing of Hypotheses 5 and 6 where the whole IP system is conceptualised, public IP enforcement has a distinct and direct effect on FDI backward and forward spillovers.

Scholars have suggested that any reference to, or examination of, an IP system should be interpreted in respect to proper IP enforcement and consequently as an interpretation of the content and adequacy of IP law protection (Maskus 2004:22) controlling for the effect of public IP enforcement on FDI vertical spillovers has been neglected. However, the results of this study indicate a significant direct positive effect. In respect to Hypotheses 3 and 4 the coefficient of the public IP enforcement on FDI backward (0.225, $p<0.001$), and forward (0.280, $p<0.001$) spillovers is positive and statistically significant, indicating that the strength of public IP enforcement has a positive impact on the productivity of domestic suppliers and buyers. This finding is consistent with the expectation in Hypothesis 3 indicating that stronger levels of public IP enforcement increase the transfer of high quality knowledge from the foreign affiliates to the domestic suppliers who update their practices and performance in this way. This is so because, it decreases the opportunistic behaviour of domestic suppliers to intentionally or unintentionally share the knowledge acquired by the foreign affiliates, as it assures them that in such cases legal action will be taken against them. Moreover, it allows MNEs to enforce their contracts in case of violation and as such it increases the incentives of MNEs to enter into more contractual agreements with the domestic suppliers and aid in the upgrade of their knowledge and sales. The results also support Hypothesis 4 and suggest that stronger levels of public IP enforcement increase the quality of foreign affiliates' outputs that, when purchased by the domestic buyers, could be utilised accordingly to improve their practices and performance. The fact that this study's results support Hypotheses 3 and 4 allows for the first time to have empirical evidence on the impact of public IP enforcement on FDI vertical

spillovers. Therefore, it is of imperative importance for future studies to consider the distinct theoretical effects of the strength of public IP enforcement and empirically test its effect on FDI spillover and other IB related topics. In addition, this result gives empirical support to scholars who conceptually highlighted the different aspects of an IP system (IP law protection and IP enforcement) and advocated in favour of the investigation of IP enforcement in future studies (Arora 2009; Maskus 2000; Peng et al. 2017a).

With regards to Hypotheses 5 and 6, the results explore another uncharted area in the literature; the moderating effect of stronger public IP enforcement on the relationship between strong IP law protection and FDI vertical spillovers. The coefficient of the moderating effect of the stronger public IP enforcement on the relationship between strong IP law protection and FDI backward spillovers was found to be negative and statistically significant (-0.0400, $p<0.001$) indicating that as public IP enforcement moves from weak to strong, it negatively impacts the positive relationship between strong IP law protection and FDI backward spillovers, supporting Hypothesis 5. Along the same lines, the coefficient of the moderating effect of the stronger public IP enforcement on the relationship between strong IP law protection and FDI backward spillovers was found to be negative and statistically significant (-0.0596, $p<0.001$). This indicates that as public IP enforcement moves from weak to strong negatively it impacts the positive relationship between strong IP law protection and FDI forward spillovers, supporting Hypothesis 6.

These results suggest that in countries where both IP law protection and public IP enforcement are strong, IP dependent MNEs are able to improve and consolidate their monopolistic power over domestic firms (suppliers and buyers)

resulting in blocking competition, attracting market demand away from domestic firms, and charging premium prices (Aitken and Harrison 1999; Smeets and de Vaal 2016). Since MNEs' bargaining power increases, domestic suppliers and buyers have less negotiating power when attempting to collaborate with them, resulting in experiencing negative changes to their productivity. By testing for the effect of the second (neglected) pillar of the IP system i.e the public IP enforcement, this study demonstrates that public IP enforcement is equally as important as IP law protection in influencing FDI vertical spillovers. By only conceptualising and testing for the effect of IP law protection, existing studies may have overestimated the effect IP law protection resulting the contradictory findings (see Havranek and Irsova 2011; Smeets and deVaal 2016). The results of this study support the theoretical predictions on FDI vertical spillovers and provide a well-established explanation on why IP enforcement matters. This study demonstrates the need for future research to consider the differential effects of both elements of an IP system i.e. IP law protection and public IP enforcement on FDI vertical productivity spillovers and other IB related topics (depending on the focus of a study).

Table 4.3 Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Coefficient backward	747	7.876314	31.19133	-74.172	290.3
t-statistics backward	712	1.325009	2.248718	-9.12903	15
Stand. Error backward	627	7.420387	13.87982	0	83.335
Coefficient forward	423	1.792778	30.40951	-59.44	615.3
t-statistics forward	386	1.222198	2.432358	-5.90476	13.6575

Stand. Error forward	331	0.475226	0.762134	0	9.643
Public IP enforcement	1,019	400.2463	89.93421	350	874
IP law protection	1,019	353.3297	44.8214	249	460
IPSS*Park	1,019	1426.826	476.7846	1020.9	3967.96
Trade openness	1,021	6432.001	1958.94	3559.899	12868.7
Tertiary education	1,031	2800.679	1072.775	0	5972.396
Financial development	1,019	5559.574	4987.854	1591.053	13698.84
R&D	1,019	63.07097	31.32455	25.70867	169.8507
Cross sectional data	1,031	0.581959	7.610087	0	1
Industry level data	1,031	34.2386	47.47383	0	1
Time span	1,031	724.0543	266.5556	1	10
No. of observations	1,012	188925.7	396241.4	35	1552557
Ln No. of observations	1,012	10.37067	2.315074	3.555348	14.25541
Foreign Presence_ employment	1,031	40.15519	49.04501	0	1
Foreign Presence_ equity	1,031	21.92047	41.39084	0	1
Technological gap	1,031	7.759457	26.76624	0	1
Horizontal	1,031	96.31426	18.85031	0	1
Olley-Pakes	1,032	21.92047	41.37076	0	1
OLS	1,032	76.13967	42.62297	0	1
GMM	1,032	31.91077	46.61308	0	1
Year fixed	1,032	43.84093	49.61921	0	1
Sector fixed	1,032	33.17168	47.08299	0	1
Publication	1,032	38.40931	48.63801	0	1
Amadeus	1,032	60.52376	48.87996	0	1

Table 4.4 Empirical estimation and associated marginal effects of meta-analysis ordered probit model – FDI backward spillovers

		Marginal effects model_ Backward (1)		
	Ordered Probit Model_Backward(1)	**Significantly Negative**	**Insignificant**	**Significantly Positive**
Public IP enforcement	0.225*** (65.591)	-0.0001607 (-1.29)	-0.1743785*** (-7.91)	0.1745392*** (7.94)
IP law protection	0.1444*** (81.96)	-0.0001032 (-1.27)	-0.1119937*** (-7.60)	0.112097*** (7.62)
IPSS*GP	-0.0400*** (-56.34)	0.0000285 (1.28)	0.0309548*** (7.70)	-0.0309833*** (-7.72)
Trade openness	-0.00215*** (-17.80)	1.60e-06 (1.24)	0.0017357*** (7.38)	-0.0017373*** (-7.39)
Tertiary education	0.00612*** (39.80)	-4.39e-06 (-1.28)	-0.0047641*** (-7.84)	0.0047685*** (7.87)
Financial development	0.00351*** (18.22)	-2.61e-06 (-1.24)	-0.0028316*** (-7.60)	0.0028342*** (7.62)
R&D	-0.253*** (-31.23)	0.0001807 (1.30)	0.1960542*** (8.21)	-0.196235*** (-8.25)
Cross sectional data	0.363*** (48.78)	-0.0002618 (-1.28)	-0.2840403*** (-7.82)	0.2843021*** (7.85)
Industry-level data	0.119*** (37.99)	-0.0000864 (-1.27)	0.0937014*** (-7.84)	0.937878*** (7.87)
Ln Number of observations	0.0945* (2.18)	-6.45e-07 (-1.15)	-0.0006999* (-2.12)	0.0007006* (2.12)
Time Span	0.0608*** (42.92)	-0.000044 (-1.28)	-0.0476892*** (-7.80)	0.0477332*** (7.83)
Foreign presence_ Employment	0.131*** (36.42)	-0.0000952 (-1.27)	-0.1032835*** (-7.70)	0.1033787*** (7.73)
Foreign presence_ equity	-0.122*** (-31.17)	0.0000893 (1.26)	0.0968926*** (8.14)	-0.0969819*** (-8.17)
Technological gap	-0.0835*** (-15.92)	0.000061 (1.26)	0.0661711*** (8.33)	-0.0662321*** (-8.37)
Horizontal	-0.637*** (-44.46)	0.0004603 (1.28)	0.4992877*** (7.94)	-0.499748*** (-7.98)
Olley-Pakes	0.0788*** (19.11)	-0.0000582 (-1.25)	-0.0631381*** (-8.19)	0.0631963*** (8.22)
OLS	-0.0277*** (-9.4)	0.0000185 (1.40)	0.0200421*** (5.70)	-0.0200605*** (-5.72)
GMM	-0.376*** (-36.39)	0.0002732 (1.27)	0.2963941*** (7.87)	-0.2966673*** (-7.90)

Year fixed	0.127***	-0.0000925	-0.1003195***	0.100412***
	(39.59)	(-1.27)	(-7.77)	(7.80)
Sector fixed	0.112***	-0.0000786	-0.0852158***	0.0852943***
	(25.61)	(-1.31)	(-7.72)	(7.76)
Publication	0.0391***	-0.0000279	-0.0302187***	0.0302465***
	(26.95)	(-1.30)	(-8.55)	(8.59)
Amadeus	0.299***	-0.0002169	-0.2353463***	0.2355632***
	(39.90)	(-1.27)	(-8.24)	(8.28)
No of observations	1000			

t statistics in parentheses $^{*}p< 0.05$, $^{**}p< 0.01$, $^{***}p< 0.001$

Table 4.5 Empirical estimation and associated marginal effects of meta-analysis ordered probit model – FDI forward spillovers

		Marginal effects model_ Forward (1)		
	Ordered Probit Model_Forward (1)	**Significantly Negative**	**Insignificant**	**Significantly Positive**
Public IP enforcement	0.280***	-1.26e-11	-0.0002287	0.0002287
	(22.91)	(-0.28)	(-1.13)	(1.13)
IP law protection	0.148***	-6.62e-12	-0.0001204	0.0001204
	(26.97)	(-0.28)	(-1.15)	(1.15)
IPSS*GP	-0.0596***	2.67e-12	0.0000487	-0.0000487
	(-28.15)	(0.28)	(1.14)	(-1.14)
Trade openness	0.00564***	-2.53e-13	-4.61e-06	4.61e-06
	(18.98)	(-0.29)	(-1.21)	(1.21)
Tertiary education	0.000470**	-2.11e-14	-3.84e-07	3.84e-07
	(2.69)	(-0.28)	(-0.91)	(0.91)
Financial development	-0.00706***	3.17e-13	5.77e-06	-5.77e-06
	(-19.14)	(0.29)	(1.20)	(-1.20)
R&D	-0.303***	1.36e-11	0.0002471	-0.0002471
	(-20.77)	(0.29)	(1.17)	(-1.17)
Cross sectional data	-0.253***	1.13e-11	0.0002064	-0.0002064
	(-19.87)	(0.29)	(1.15)	(-1.15)
Industry-level data	0.0369***	-1.65e-12	-0.0000301	0.0000301
	(9.64)	(-0.29)	(-1.20)	(1.20)
Ln Number of observations	0.396*	-1.78e-13	-3.24e-06	3.24e-06
	(2.39)	(-0.31)	(-1.95)	(1.95)
Time Span	-0.0604***	2.71e-12	0.0000493	-0.0000493
	(-27.53)	(0.29)	(1.19)	(-1.19)
Foreign presence_ Employment	-0.105***	4.72e-12	0.0000859	-0.0000859
	(-22.03)	(0.29)	(1.18)	(-1.18)

Foreign presence_ equity	0.102*** (21.01)	-4.58e-12 (-0.29)	-0.0000834 (-1.21)	0.0000834 (1.21)
Technological gap	0.196*** (10.85)	-8.78e-12 (-0.29)	-0.0001599 (-1.31)	0.0001599 (1.31)
Horizontal	0.523*** (27.74)	-2.35e-11 (-0.29)	-0.0004271 (-1.20)	0.0004271 (1.20)
Olley-Pakes	-0.00285 (-0.48)	1.28e-13 (0.32)	2.33e-06 (0.60)	-2.33e-06 (-0.60)
OLS	-0.0431*** (-10.03)	1.93e-12 (0.29)	0.0000352 (1.27)	-0.0000352 (-1.27)
GMM	0.258*** (21.08)	-1.16e-11 (-0.29)	-0.0002109 (-1.22)	0.0002109 (1.22)
Year fixed	-0.117*** (-19.69)	5.23e-12 (0.29)	0.0000953 (1.15)	-0.0000953 (-1.15)
Sector fixed	-0.0241** (-3.15)	1.08e-12 (0.27)	0.0000197 (0.92)	-0.0000197 (-0.92)
Publication	0.108*** (34.10)	-4.83e-12 (-0.29)	-0.0000879 (-1.19)	0.0000879 (1.19)
Amadeus	-0.0564*** (-6.90)	2.53e-12 (0.29)	0.000046 (1.29)	-0.000046 (-1.29)
Number of observations	1000			

t statistics in parentheses $^{*}p< 0.05$, $^{**}p< 0.01$, $^{***}p< 0.001$

With regards to the estimations relating to the effects of other country level variables, the findings regarding the FDI backward spillovers are mainly in line with the existing literature. Specifically, the coefficient of trade openness is negative (-0.00215) and statistically significant (p<0.001) suggesting that foreign affiliates may use the advantages of an open to trade country to import intermediate goods at lower prices and not purchase them through domestic suppliers. As such, due to the competition effect, domestic suppliers may experience negative changes in their productivity. Next, the coefficient of financial development is positive (0.00351) and statistically significant (p<0.001). This finding supports the arguments that domestic suppliers who have access to financial capital can develop technologically advanced goods that will be purchased by the foreign affiliates resulting in their increased

productivity. Lastly the coefficients corresponding to human capital (i.e. tertiary education and R&D expenditures) are contradictory. Tertiary education is positive and statistically significant (0.00612, $p<0.001$), supporting the view that a skilled labour force has the capabilities to produce technologically advanced goods that can be purchased by the foreign affiliates; but R&D expenditures is negative (-0.253, $p<0.001$) suggesting that R&D oriented domestic suppliers experience negative changes in their productivity. An explanation could be that R&D oriented suppliers may sell the intermediate goods at relatively high prices and foreign affiliates making use of the advantages of an open to trade country, import from other countries' equally advanced intermediate goods at lower prices. With respect to the control variables the results show that studies using industry-level data find stronger FDI backward spillovers, in line with Havranek and Irsova (2011), and studies using cross sectional data also tend to find stronger FDI backward spillovers. The results also suggest that the choice of a foreign presence proxy is a determinant of differences across studies. Most studies use the share of employment/sales or equity in foreign-owned firms as a proxy to capture the degree of foreign presence in the country. Studies that include separate dummy variables for foreign equity or foreign employment share, found that the former produces negative spillover effects ($p<0.001$), but the latter produces positive results ($p<0.001$), in contrast to Havranek and Irsova (2011). These results indicate that the way researchers define and proxy for foreign presence does make a difference to their final outcomes. Moreover, the results suggest that studies controlling for FDI horizontal spillovers, when estimating FDI backward spillovers, tend to find less significant positive spillover effects. Regarding the technological gap, the coefficient is negative and

statistically significant ($p<0.001$) suggesting that studies controlling for the technological gap between foreign affiliates and domestic suppliers, tend to find more negative backward spillover effects. Another important observation concerns the estimation techniques researchers use to estimate FDI backward spillovers. When researchers use the Olley-Pakes year fixed and sector fixed estimation techniques, they tend to find more positive significant backward spillovers effects whereas studies using the OLS and GMM estimation techniques yield negative significant results. The coefficient of the publication variable is positive (0.0391) and statistically significant ($p<0.001$) indicating the presence of publication bias in this meta-regression model, suggesting that peer reviewed journals tend to publish studies that find positive FDI backward spillovers. Lastly the Amadeus database is positive and statistically significant indicating that studies extracting their data from this database tend to find positive FDI backward spillover effects.

In this section the results regarding the FDI forward spillovers are presented. The positive (0.00564) and statistically significant ($p<0.001$) coefficient of trade openness, indicates that domestic buyers operating in an open to trade country can exploit the advanced inputs purchased by the foreign affiliates and experience positive productivity changes. Turning to the coefficient of financial development, this is negative (-0.00706) and statistically significant ($p<0.001$) suggesting that domestic buyers operating in less developed financial systems have limited access to capital and thus cannot purchase advanced technological inputs which will aid them to increase their productivity. Lastly the coefficients corresponding to human capital (i.e. tertiary education and R&D expenditures) are contradictory. Tertiary education is positive and statistically

significant (0.000470, p<0.001) supporting the view that skilled labour force has the capabilities to use and adapt the technologically advanced purchased inputs by the foreign affiliates in order to increase their productivity. However, R&D expenditure is negative and statistically significant (-0.303, p<0.001) suggesting that R&D intensive buyers may experience a decrease in their productivity due to the foreign presence. This is because as the monopolistic power of MNEs increases (with the strengthening of the host country's IP system), the price of MNEs' technologically advanced outputs increase making it difficult for R&D intensive buyers to purchase the necessary inputs required when undertaking R&D.

With respect to the control variables, the results show that studies using industry-level data find stronger FDI forward spillovers, in line with Havranek and Irsova (2011), while studies using cross-sectional data tend to find negative FDI forward spillovers. The results also suggest that the choice of a foreign presence proxy is a determinant of differences across studies. Most studies use the share of employment/sales or equity in foreign owned firms as a proxy to capture the degree of foreign presence in the country. In studies that include separate dummy variables for foreign equity or foreign employment share, it is found that the former produces negative spillover effects results (p<0.001), but the latter produces positive results (p<0.001) in contrast with Havranek and Irsova (2011). Moreover, the results suggest that studies controlling for FDI horizontal spillovers when estimating FDI forward spillovers, tend to find positive spillover effects. Regarding the technological gap, the coefficient is positive and statistically significant (p<0.001) suggesting that studies controlling for the technological gap between foreign affiliates and domestic suppliers tend to find

more positive forward spillover effects. Turning to the estimation techniques researchers used to estimate FDI forward spillovers, the results suggest that studies using the Olley-Pakes (OLS) year fixed and sector fixed estimation techniques tend to find negative spillover effects whereas studies using the GMM estimation technique tend to find positive ones. Regarding the potential for publication bias in this meta-analysis, the coefficient on the publication variable is positive (0.108) and statistically significant ($p<0.001$) indicating the presence of publication bias in this meta-regression model, again suggesting that peer reviewed journals tend to publish studies that find positive FDI forward spillovers. In contrast with the FDI backward spillovers, the Amadeus database is negative and statistically significant suggesting that studies extracting their data from this database tend to find more negative FDI forward spillover effects.

4.4.1. Marginal effects of FDI vertical spillovers

Table 4.4 and 4.5 also report the marginal effects of the meta-analysis ordered probit model for the FDI backward and forward spillovers. The marginal effects findings for the FDI backward spillovers are consistent with the ordered probit findings supporting Hypotheses 1, 3 and 5. Specifically, public IP enforcement is positive and statistically significant ($p<0.001$) for FDI backward spillovers, indicating that as public IP enforcement becomes stronger, the probability of domestic suppliers experiencing positive changes in their productivity increases. Similarly, IP law protection is positive and statistically significant ($p<0.001$) suggesting that as IP law protection is strengthened the probability of domestic suppliers experiencing positive changes in their productivity increases. The marginal effect for the moderator variable is negative and statistically significant ($p<0.001$) indicating that as public IP enforcement is strengthened, it negatively

impacts the positive relationship between strong IP law protection and FDI backward spillovers, increasing the probability of domestic suppliers experiencing negative changes in their productivity. In respect to the dummy variables, the marginal effects findings are also consistent with the ordered probit findings. Indicative and holding other variables constant at their means, cross-sectional data and industry level variables are positive and statistically significant ($p<0.001$), showing how studies using industry level data and cross-sectional data are much more likely to find positive FDI backward spillover effects than studies using firm level data and panel data. Similarly OLS and GMM variables are negative and statistically significant ($p< 0.001$), suggesting that for studies using the OLS and GMM estimation technique the probability of finding negative FDI backward spillover effects is greater. Lastly the publication variable is positive and statistically significant ($p<0.001$), suggesting that studies published in peer reviewed journals are more likely to present positive FDI backward spillovers results.

The marginal effects for the FDI forward spillovers are statistically insignificant and thus the economic effects of the effect size on the FDI forward spillovers cannot be identified.

4.5. Conclusions

This paper builds on and extends the meta-analytical work of Havranek and Irsova (2011) on the effect of stronger IP systems on FDI vertical spillovers. This study theoretically and empirically addresses a research gap in the literature concerning the distinct direct and moderating effect of the strength of public IP enforcement in a host country. Although theory suggests that 'the real issue is whether a country adequately enforces the laws and regulations it has in place' (Maskus 2004:22) existing studies on FDI vertical spillovers have only considered the direct effect of the strength of IP law protection to proxy for the effect of IP systems overall, finding mixed results (Havranek and Irsova 2011; Smeets and de Vaal 2016). In this study it is argued that the mixed evidence produced by the aforementioned studies may relate to the way IP systems are conceptualized and empirically tested. Although the aforementioned studies intend to capture the overall effect of IP systems empirically test only for one element of the IP system that of the strength of the IP law protection and do not consider variation in the way IP law protection is actually enforced in practice. Such omission could arguable result in biased research findings. This study conceptually uncovers and empirically tests for two neglected areas in the literature, the direct and moderating role of the strength of pubic IP enforcement on FDI vertical spillovers.

This study introduced for the first time the effect of the strength of public IP enforcement on the investigation of FDI vertical spillovers and finds that it has a direct positive effect on the productivity of domestic suppliers and buyers. Furthermore, it is suggested that stronger levels of public IP enforcement negatively moderate the effect of strong IP law protection on FDI vertical

spillovers. The results suggest that when either IP law protection or public IP enforcement is strengthened in a country, it increases the incentives for direct knowledge transfer (from foreign affiliates to domestic suppliers and buyers) and promotes the development of better quality processes/products by the domestic suppliers and buyers, leading to positive changes in their productivity. However, the overall impact of increased IP strength (moderating effect of public IP enforcement on the relationship between stronger IP law protection and FDI vertical spillovers) comes at the expense of domestic suppliers and buyers as it allows MNEs to improve and consolidate their monopolistic power over them resulting in blocking competition, attracting market demand away from domestic firms, and being able to charge premium prices (Aitken and Harrison 1999; Smeets and de Vaal 2016). These findings bring to the foreground an ongoing debate among scholars regarding the degree IP systems need to be protected and enforced. On one hand proponents of stronger IP systems argue that it will enhance MNEs innovative activities, stimulate the production of high edge technological knowledge, promote cross-border knowledge transfer and through spillover effects positively influence domestic firms' productivity (Maskus 2000). On the other hand, opponents point out that strengthening countries' IP system will shift the rents of innovation towards MNEs and enhance their monopolistic power resulting in negatively impacting domestic firms' productivity (Maskus 2000). Indeed, this trade-off is present in the results of this study suggesting that governments and policy makers need to be aware of the potential negative impact to FDI vertical spillovers in countries where both IP law protection and public IP enforcement are strong. It is therefore important that governments and policy makers monitor

closely the effect of stronger IP systems on FDI vertical spillovers and intervene when appropriate to avoid or overcome such problems.

Based on this study's findings it is suggested that as a response to the strengthening of their IP systems, governments in order to increase the probability of benefiting from FDI vertical spillovers could make adjustments to the following areas; i) market structure, ii) pricing regulations such as clawback policy and iii) competition policies. For an extensive discussion on policy and managerial implications see Chapter 6.

CHAPTER 5

THE EFFECT OF IP SYSTEMS ON BILATERAL FDI FLOWS IN OECD COUNTRIES

5.1. Introduction

Chapter 5 investigates the role of national Intellectual Property (IP) systems and particularly the effectiveness of public IP enforcement (e.g. customs, judiciary) on bilateral Foreign Direct Investment (FDI) flows in OECD countries. Since the mid-1990s FDI has been a key strategy implemented by developed and developing countries when investing abroad (Villaverde and Maza 2015). Home countries can benefit from an expanding market, lower cost factors (such as raw materials, labour etc.) and other tariff measures, while host countries with good factor endowments, high potential markets, adequate infrastructure (such as institutions) can attract significant levels of FDI that brings with it capital, technology and managerial know-how (Kahouli and Maktouf 2015). With the rise of FDI, scholars paid particular attention in identifying the key FDI determinants that increase host countries' attractiveness. One emerging finding from existing studies is that FDI flows are contingent on: (1) market size, (2) labour costs, (3) exchange rates, (4) trade openness, (5) inflation rates, (6) human capital, (7) a host country's factor endowments, (8) a host country's institutions such as taxation system, corruption levels, intellectual property

rights (IP) system, (9) a host country's geographical position (Blonigen 2005; Feath 2009).[18]

Building on the overall consensus in IB research that 'institutions matter' (North 1991), the effect of IP systems (as part of a country's institutional setting) on FDI flows has been researched extensively suggesting that stronger IP systems act as a location advantage for MNEs and increase levels of inward FDI (e.g. Puttitanum 2002; Awokose and Yin 2010; Khan and Samad 2010; Branstetter et al. 2007; Seyoum 1996; Mansfield 1994; Javorcik 2004; Nunnenkam and Spatz 2004; Park and Lippoldt 2003). However the existing research findings evince two limitations.

First, in the majority of the existing studies an IP index is used as a single variable to proxy for the effect of the IP system in force. This approach assumes that both IP law protection and public IP enforcement are captured by the IP index in use (Papageorgiadis and McDonald 2018f). The most commonly employed index in these studies is the Ginarte and Park (1997) or Park (2008) patent protection index (Puttitanum 2002; Awokose and Yin 2010; Khan and Samad 2010; McCalman 2004; Bascavusoglu and Zuniga 2005; Branstetter et al. 2007). However this index is 'designed to provide an indicator of the strength of patent protection and not the quality of patent systems' (Park 2008:761), and therefore does not capture the enforcement element of an IP system (Fosfuri 2004; Javorcick 2004; Nicholson 2007; Nunnenkamp and Spatz 2004; Papageorgiadis et al. 2014). Studies using measures that do not take public IP enforcement into account, may unintentionally overestimate the effect of IP law

[18]Because the focus of this paper is the IP systems as a determinant of FDI, a complete summary of the FDI determinants is beyond its scope. As a short reference it is worthy of mention the existence of two surveys on the issue by Blonigen (2005) and Faeth (2009).

protection in a particular country (Ostergard 2000) and thus suffer from biased and non-reliable results. The omission of public IP enforcement in the empirical investigation of the effect of IP systems on bilateral FDI flows constitutes the **first research gap** that this Chapter aims to address.

A few studies acknowledging the importance of the public enforcement element of an IP system, have made attempts to capture its effect using either, (i) survey data to capture the perceptions of business practitioners regarding the quality of public IP enforcement, or (ii) by developing their own enforcement index. For instance, researchers in the first category using surveys include: Seyoum (1996) used a questionnaire administered to IP experts and practitioners, to proxy for the effect of both IP law protection and public IP enforcement; Mansfield (1994) employed a survey administered to 94 US firms capturing the importance of IP system on FDI decision; Nunnenkam and Spatz (2004) and Park and Lippoldt (2003) employed the Ginarte and Park (1997) index, to proxy for the effect of IP law protection, and the WEF index to proxy for the effect of public IP enforcement.[19] Instances of researchers in the second category include Javorcik (2004) who developed an index that measures the quality of public IP enforcement by quantifying reports and other secondary data on IP enforcement effectiveness. In fact, Javorcik (2004) used the Ginarte and Park (1997) index to proxy for the availability of IP law protection and 'then implemented a quantified version of the qualitative descriptions of the strength of IP systems provided by the International Intellectual Property Alliance (IIPA)

[19] The World Economic Forum (WEF) index attempts to capture the availability of IP law protection and effectiveness of public IP enforcement by collecting data through a survey administered to MNEs' executives operating in multiple countries. The executives were asked to rate IP law protection and enforcement in the countries they operate with their responses ranging from 1 (very weak) to 7 (very strong). The WEF index includes data from 131 countries and is published annually from 1971.

in their recommendations for countries to be placed on the USTR's 301 Watch List' (Papageorgiadis and McDonald 2018).

Although both categories of studies, to some extent, capture the effect of both IP law protection and public IP enforcement on FDI flows, they suffer from the following limitations. First, the survey-based studies in the literature receive a low number of responses which limits the usability and meaningfulness of the final index scores (Papageorgiadis and McDonald 2018). Second, it is not clear what aspects of the public IP enforcement measurements are captured. As explained in Chapter 2 enforcement relates to the enforcement agents' perceptions/ideologies towards fairness and justice and the effectiveness of the IP administration systems to fairly enforce the IP law. As such, the enforcement agents' ideologies and culturally inherited norms of behaviour and IP administration systems' actions need to be adequately defined and measured. This is a very difficult and demanding process that has not been sufficiently explained or justified in the previous studies mentioned. Third, these studies were conducted either before the TRIPs agreement or during its implementation period. This means that their conclusions are not applicable today since most of the included countries have now changed their respective IP legal frameworks in accordance with the TRIPs agreement mandates. Thus, the availability of IP law protection and the effectiveness of public IP enforcement may have since altered, making the conclusions drawn from these studies applicable only for a particular time-period (before 2006). Lastly, many studies employ or develop a different measure for public IP enforcement, any meaningful comparison and generalisation of existing studies' research findings is difficult. These four limitations outlined above constitute the **second research gap** that this Chapter

aims to address by employing a composite IP enforcement index - the International Patent System Strength (IPSS) – which captures a variety of public IP enforcement aspects during and after the TRIPs agreement.

To address the aforementioned research gaps, I posit the following research question: **RQ3**: what are the distinct effects of the IP law protection and public IP enforcement on bilateral FDI flows in OECD countries ?

By addressing the above research question, this study seeks to make the following contributions to the literature. First, this study conceptualises IP systems as having two pillars - the IP law protection and the public IP enforcement - in contrast to the majority of existing studies, which do not differentiate between these two elements of an IP system and assume that IP law protection and IP enforcement have a unified outcome. This study also makes an empirical contribution as it employs a newly developed IP enforcement index; the Papageorgiadis et al., (2014) international patent systems strength index (IPSS). This index allows for the proxy of the effect of public IP enforcement by overcoming the limitations identified in extant studies. This is achieved as the IPSS index is developed by following a consistent methodology recommended by the Organization for Economic Co-operation and Development (OECD) in Constructing Composite Indicators, and captures a variety of IP enforcement dimensions. Namely, (1) the quality of patent administration, (2) judicial enforcement, (3) the level of corruption in judiciary, (4) the effectiveness of police enforcement, (5) the strength of border controls, (6) the perception of patent owners about national patent legislation and enforcement levels, (7) the cultural and societal attitudes towards the purchase

of infringing goods, and (8) the level of public commitment to patent legislation (Papageorgiadis et al. 2014).

Second, following the global changes in the IP systems this study is the first to investigate the effect of effective public IP enforcement in bilateral FDI flows in OECD countries after the TRIPs agreement. As has already been highlighted, all countries that have signed the TRIPs agreement have implemented significant changes to their IP legal framework leading to a stronger IP law protection framework (Peng et al. 2017). This implies that the levels of IP law protection in WTO countries are high and approximately the same. However, this is not the case for the degree to which IP law protection is enforced, as in many emerging and developing countries, such as China, public IP enforcement remains relatively weak and subject to local ideologies or political decisions (Peng et al. 2017). In such cases strong IP law protection is considered to be 'window dressing'. Building on these facts, this study moves away from the current research conclusions that hold IP law protection as a key FDI determinant and suggests that in the post-TRIPs agreement era, the effectiveness of public IP enforcement alone will influence the levels of bilateral FDI. As such, this study puts forward a new FDI determinant, that of the public IP enforcement.

The last contribution lies in the chosen methodological approach, the use of the Poisson pseudo-maximum-likelihood (PPML) technique, in estimating the gravity model of bilateral FDI determinants. With the use of the gravity model this study attempts to investigate the impact of IP systems on inward FDI from a host country's perspective. Given the fact that bilateral FDI between country-pairs could be zero (0), the existence of observations for which the dependent

variable is zero makes the estimation of gravity model in the log-linearised form infeasible (Silva and Tenreyro 2006). To address this issue the PPML technique introduced by Silva and Tenreyro (2006) is employed. This technique, unlike the standard panel data estimation techniques such as fixed/random effects model, does not require the dependent variable be expressed in a log-linearised form and thus zero values for the dependent variable can be included. To date, five empirical studies on bilateral FDI flows using the PPML technique have been identified, but no studies have been found on the effect of IP systems' bilateral FDI flows (Benassy-Quere et al. 2007; Desbordes and Vicard 2009; Julio et al. 2013; Busse et al. 2010; Head and Ries 2008).

5.2. Related literature and hypotheses

5.2.1. Eclectic paradigm

The decision of MNEs to invest abroad is best summarised in Dunning's (1993) Eclectic paradigm. The Eclectic paradigm considers that FDI is determined by the benefits of ownership, location and internalisation that MNEs have in foreign markets (Dunning 1993; Javorcik 2004; Kahouli and Maktouf 2015). When MNEs invest in a foreign market, they are at least initially disadvantaged because domestic firms have better knowledge of local market conditions (Javorcik 2004). In order to compete successfully in a foreign market, MNEs need to possess some forms of ownership advantage that confer market power and cost efficiencies, such as superior production technology, managerial and technological know-how, innovation capability, reputation, and/or intangible assets such as IP (Dunning 1993; Javorcik 2004; Villaverde and Maza 2015).

Location provides an explanation on where the ownership advantage can be best exploited and where it is more profitable to locate the business (Dunning 1993). Host countries that offer, high quality endowments, low transportation, communication and labour costs, favourable political and economic conditions, and well-developed institutions (such as strong IP systems) often attract greater inflows of FDI (Javorcik 2004; Yi et al. 2015). In particular, a plethora of evidence suggests that for IP dependent MNEs, the availability of IP law protection is a strong location advantage attracting inward FDI (Puttitanum 2002; Awokose and Yin 2010; Khan and Samad 2010; McCalman 2004; Bascavusoglu and Zuniga 2005; Branstetter et al. 2007). In the pre-TRIPs and TRIPs implementation period where IP legislation differ among countries, IP law protection was a key determinant of FDI as it allowed (or not) IP dependent MNEs to register their IP and potentially gain an ownership advantage in the host country. At that time IP enforcement was treated as an afterthought as the main concern of MNEs was to ensure not only the register and granting of their IPR, but also the right to exploit their IP in the host country.[20] However in the post-TRIPs agreement era, the majority of WTO countries have now harmonised the level of IP law protection, adopting a strong IP legal framework. Because of these changes much of the attention is now turned to the degree to which IP law protection is actually enforced in case of violation (Peng et al. 2017). In today's world, with the majority of MNEs basing their profitability on the development and exploitation of intangible assets, transaction costs stemming from the strong/weak IP enforcement in the host country can also

[20] Recall that especially in the pre-TRIPs agreement era (before 1995) many countries like Canada granted IPR only to domestic inventors and not to foreigners (Peng et al. 2017).

impact the flows of FDI.[21] In the case of weak public IP enforcement, MNEs' monitoring and enforcement is increased because of institutional uncertainty in situations where domestic competitors driven by competition may engage in opportunistic behaviours and attempt to illegally acquire information for the specific asset under transaction (i.e. MNEs' IP) (Geyskens et al. 2006). In the case where a country offers effective public IP enforcement, this reduces MNEs' transaction costs by restricting the competitors' opportunistic behaviours and thus reducing MNEs' institutional uncertainty (Bevan and Estrin. 2004; Kafouros and Aliyev 2016; Krammer 2015). Therefore, it can be argued that public IP enforcement is now a strong location advantage for IP dependent MNEs as it increases or decreases a host country's attractiveness.

Lastly, internalisation refers to the advantage of owning, controlling and coordinating the use of specific assets within the MNE (Dunning 1993). Applying the insights from TCT (Williamson 1981), it is suggested that in the absence of opportunism and in a world with access to perfect information, the most low-cost governance mechanism would be a simple contract with the market (Fosfuri 2004), for instance licensing. However, due to the opportunistic nature of humans, bounded rationality and incompleteness of all contracts, writing and executing a contract for the use of a specific asset (such as IP), generates transaction costs in the form of monitoring and enforcement (North 1992; Williamson 1981). Internalisation through FDI, instead of licensing or exporting, has the advantage of lowering MNEs' transaction costs since it minimises the possibility of misappropriation of their assets under transactions

[21] According to the WEF (2016) the following MNEs belong to the top 10 list of the most profitable companies in the world: Apple, Google, Microsoft, Facebook, Johnson & Johnson, General Electric, China Mobile, who all base their success on the possession and exploitation of a series of IPR.

and hence preserves their ownership advantage (Faeth 2009; Javorcik 2004). Under strong public IP enforcement in the host country, MNEs will have the opportunity to make full use of both internalisation advantages and licensing agreements since transaction costs associated with the misappropriation of MNEs' IP will be kept low (Maskus et al. 2013; Smith 2001). Research however also suggests that MNEs may engage in affiliate licensing instead of unaffiliated licensing to minimise the positive externalities or spillovers, due to the public good nature of knowledge. In other words, strong public IP enforcement ensures IP owners that their rights will be upheld in case of violation. However, if no violation of contracts occurred for the asset under transaction and the contracting party legally acquired additional information other than the ones specified in the contract, due to the public good nature of knowledge, MNEs may stand to lose their ownership advantage in the host country. Internalising their activities via FDI in countries with strong public IP enforcement, allows MNEs to restrict their IP inside the firm and enforce their rights in cases where competitors access and misappropriate them.

To sum up, in this study it is argued that weak public IP enforcement increases the opportunistic nature of humans and consequently the probability of imitation and increased MNEs transaction costs. In turn misappropriation of MNEs' IP assets may erode its ownership advantage in the host country. Moreover weak public IP enforcement reduces a host country's attractiveness and thus location advantage (Javorcik 2004) making MNEs reluctant to invest. Conversely, strong public IP enforcement, restricts competitors' opportunistic behaviours, reducing the probability of imitation and MNEs' transaction costs. As such it acts as a strong location advantage, allowing MNEs to preserve and exploit their

ownership advantage in the given country (Bénassy-Quéret et al. 2007; Bevan and Estrin 2004; Seyoum 2006).

5.2.2. IP law protection and bilateral FDI flows

Research into the effects of IP law protection on FDI flows is extensive and has overall produced mainly consistent findings; as IP laws become stronger in the host countries, inward FDI increases. For instance: Puttitanum (2002) in 62 developed and developing countries; Awokose and Yin (2010) in China; Khan and Samad (2010) in 14 developing South and Southeast Asian countries; Mc Calman (2004) in 40 developed and developing countries; Bascavusoglu and Zuniga (2005) in 38 developed and developing countries; Kashcheeva (2013) in 103 developed and developing countries; and Branstetter et al. (2007) in 16 developing countries. To approximate for the strength of IP law protection these studies employed the patent protection indices by Ginarte and Park (1997) and Park (2008) that account for and measure the level of patent law protection in 122 countries.[22]

In light of the empirical studies cited above it can be argued that strong IP law protection in the host countries increases FDI flows. However, the existence of strong IP law protection does not mean that IP laws will be enforced in practice. In some instances, IP laws are merely used as 'window dressing' by host countries which offer strong IP law protection either as part of the TRIPs agreement or their own legal infrastructure, but then have no strong public IP enforcement (Peng et al. 2017a,b). Those countries increase their IP law

[22]Note that these two indices do not include a measurement for patent enforcement (Fosfuri 2004; Javorcick 2004; Nichloson 2007; Nunnenkamp and Spatz 2004; Papageorgiadis et al. 2014).

protection levels in order to attract technologically intensive FDI, but may still maintain weak or moderate public IP enforcement levels to allow domestic firms to benefit from FDI spillovers, through demonstration effect, labour turnover channel and illegal imitation (Peng et al. 2017a,b). This is particularly the case in countries with low levels of economic development, where benefits from the protection of foreign IP simply accrue to foreign firms, while domestic consumers and firms have to bear the costs for acquiring the IP protected goods (Peng et al. 2017b). Nevertheless, when MNEs see a strong IP law protection framework enacted by a legislature, they perceive it as a positive signal regardless of the level of IP enforcement in a host country (Khoury et al. 2014). To summarise, strong IP law protection can work as either a quality institution or as 'window dressing' for host countries to attract FDI. .

Hypothesis 1: *The strength of IP law protection in a country has a positive effect on bilateral FDI flows in OECD countries*

5.2.3. Public IP enforcement and bilateral FDI flows

It has long been argued that strong public IP enforcement assures IP dependent MNEs that theirs rights will be granted and more importantly upheld in case of violation. The strength of public IP enforcement can influence FDI flows in two ways: (1) decrease MNEs' transaction costs and (2) attract skills-based resource seeking FDI and strategic asset seeking FDI.

In respect to MNEs transaction costs, TCT suggests that the level of transaction costs depends upon the specificity of the assets under transaction and the uncertainty in the environment where transactions are taking place (Williamson 1981). Weak public IP enforcement increases institutional uncertainty as

competitors engaging in imitative activities may produce substitutes for the MNEs' IP protected products, consequently attracting demand away from the MNEs by offering substitute products at lower prices, and decreasing their returns on investment. In such cases, IP owners (MNEs) are faced with excessive enforcement costs of the following nature. First, costs may arise if the infringer is not seized and taken to court by the relevant public enforcement agents. Second, even if the infringer is taken to court, firms still need bear the costs of the resolutions process (for instance legal fees) but might not receive appropriate levels of compensation (Pinkham and Peng 2017). Third, the ineffectiveness of the public enforcement authorities and judicial system and the delays in detecting and seizing the infringers, allow the infringers to continue profiting from the sale of the disputed IP embedded goods, at the expense of the IP owners. Fourth, IP owners may find themselves implicated in protracted and costly court trials which finally conclude with the IP owners losing brand reputation impacting their customers, suppliers and other business partners (Pinkham and Peng 2017; Khanna and Palepu 1997). With strong public IP enforcement, MNEs' transaction costs are reduced by: (1) confining competitors' opportunistic behaviours; and (2) reducing MNEs' institutional uncertainty (Bevan and Estrin 2004; Kafouros and Aliyev 2016; Krammer 2015).[23]

Apart from the location advantages outlined in the Eclectic paradigm, the decision of MNEs for selecting specific locations in which to invest are also associated with MNEs FDI motivation and include: (1) natural-resource seeking, (2) strategic asset seeking, (3) market seeking, and (4) efficiency seeking

[23] See review paper by Geyskens et al. (2006) for an extensive explanation of transaction cost theory.

(Dunning 1993). Countries where MNEs can pursue one or more of the aforementioned motives are hypothesised to be able to attract higher levels of inward FDI. In respect to the resource and strategic asset seeking FDI motives, Dunning (1993) suggests that MNEs pursuing FDI are driven by four motives: resource seeking, strategic asset seeking, market seeking and efficiency seeking.[24] Resource seeking FDI includes physical, labour and skills-based resource seeking FDI. The skills-based resource seeking FDI refers to FDI seeking to acquire technological capabilities, management or marketing expertise and organisational skills through collaborations with a domestic partner or the establishment of a foreign affiliate in a technologically intensive region (Dunning 1993). Strategic asset seeking FDI refers to FDI seeking to acquire tangible and intangible assets (equipment, human resource, patents, suppliers and consumers databases), in order to more effectively achieve their strategic objectives, expand their global portfolio, sustain or strengthen their ownership advantage or even build an ownership advantage that will support their long-term expansion at home and in foreign countries (Dunning 1993).

The literature on location choice has recognised the technological capabilities of the host location as an important factor for attracting technologically intensive FDI (Meyer 2015). In relation to public IP enforcement, it is suggested that countries offering strong public IP enforcement create incentives for domestic firms to engage in R&D activities and develop advanced technological outputs, as it assures them that their rights will not only be granted but will also be upheld in case of violation. Such technologies are valued by MNEs pursuing resource and strategic asset seeking aiming to upgrade their asset portfolio by

[24]Further discussion on the efficiency seeking and market seeking motives of FDI will not take place as this is beyond the scope of this study (see Dunning (1993) for a complete review).

acquiring advanced technologies. This means that MNEs may see opportunities in engaging in contractual agreements with domestic firms (for instance from JVs). Indeed, evidence suggests that a significant proportion of FDI is directed to countries with a relatively well developed science base (Walter 1998) underpinned by strong IP law protection and more importantly, strong public IP enforcement. Moreover, investing in a R&D intensive country MNEs can obtain information about the latest technologies via public patent disclosures and upgrade their own technological capabilities accordingly. For instance, MNEs investing in China will have access to 1.2 million domestic and foreign patent disclosures (based on 2005 figures) (Peng et al. 2017).

Although studies on the effect of public IP enforcement on FDI flows are scarce, the majority reveals a positive relationship. For instance Seyoum (1996) with the use of a questionnaire administered to IP experts and practitioners (to proxy for the effect of both IP protection laws and IP enforcement) in 27 developed and developing countries, between 1975-1990, identified that stronger IP law protection and public IP enforcement increase inward FDI. Similarly, Mansfield (1994) with a survey administered to 94 US firms capturing the importance of IP on FDI decisions for the year 1991 identifies a positive relationship between IP law protection, public IP enforcement and inward FDI. Along the same lines, Nunnenkam and Spatz (2004) for 166 developed and developing countries between 1995 and 2000, and Park and Lippoldt (2003) between 1990-2000, by employing the Ginarte and Park (1997) index (to proxy for the effect of IP law protection) and the WEF index (to proxy for the effect of public IP enforcement) revealed that the level of inward FDI increases with the strengthening of IP law protection and enforcement.

Based on these theoretical arguments and empirical evidence, the second hypothesis is specified as:

Hypothesis 2: *The strength of public IP enforcement in a country has a positive effect on bilateral FDI flows in OECD countries*

5.3. Methodology

5.3.1. The Gravity model

Initially the gravity model used an analogy to Newton's universal laws of gravitation to explain patterns of bilateral trade (Eaton and Tamura 1994).[25] In its simplest form the gravity equation for trade states that trade flows from home (i) to host countries (j) are proportional to the countries' market size (GDP_i , GDP_j) and inversely proportional to their distance (D_{ij}) (Silvia and Tenreyo 2006). More generally,

$$Trade_{ij} = a_0 * GDP_i^{a_1} * GDP_i^{a_2} * D_{ij}^{a_3} \qquad (1)$$

where a_0, is a constant and a_1, a_2, a_3, are parameters for each perspective variable.

In trade literature there is a long tradition of estimating the log- linearized form of equation (1) and estimating the parameters of interest by least squares, using the equation[26]:

$$lnTrade_{ij} = a_0 + a_1 lnGDP_i + a_2 lnGDP_j + a_3 lnD_{ij} + u_{ij} \qquad (2)$$

Although the gravity model was first developed in the context of international trade (Eaton and Tamura 1995), recently it has been extensively used to examine and explain the FDI determinants between countries (Kahouli and Maktouf 2015; Bevan and Estrin 2004; Buch et al. 2003; Blonigen et al. 2007) and has been characterised as 'arguable the most widely used empirical

[25]Newton defined the laws of universal gravitation by suggesting that two particles of matter are subject to a force (gravity) that attracts each other and is proportional to the product of their masses and inversely proportional to their distance.
[26] For more information on the use of the log- linearizing equation see Silva and Tenreyro (2006).

specification of FDI determinants (Blonigen et al. 2007:1309). In the present context the gravity model relates the volume of bilateral FDI to the GDPs of the home and host countries and the geographical distance between them (Desbordes and Vicard 2009). It is expected that the larger the market sizes of home and host countries the greater the inward FDI will be, while the greater distance between the home and host country the less inward FDI to the host country will be. It should also be noted the relationship between FDI and geographical distance is not that straightforward (Kahouli and Maktouf 2015). On one hand, if countries are distant from each other, higher transportation costs and less control over the exporting activities would make FDI more appealing (Kahouli and Maktouf 2015). On the other hand, when countries are far away from each other, there can also be differences in institutional settings such as the legal system, differences on cultural characteristics such as language or informal norms, making companies unwilling to commit FDI (Kahouli and Maktouf 2015). Nevertheless, in the study of bilateral FDI flows the geographical distance often is used as a control variable -proxy for the costs related to institutional distance costs, cultural distance costs, as well as the geographical distance (Desbordes and Vicard 2009). In the majority of the empirical studies on bilateral FDI flows the gravity equation in its basic form is specified as the following:

$$lnFDI_{ij} = \beta_0 + \beta_1 lnGDP_i + \beta_2 lnGDP_j + \beta_3 lnD_{ij} + \gamma F + u_{ij} \quad (3)$$

In which FDI_{ij} representing either the investment flows or stocks of country i to country j, GDP_i , GDP_j the market size of home country i and host country j respectively, D_{ij} the distance in Km between country i to j and u_{ij} an error term.

F_{ij} is a vector that represents the variables of interest. Such variables of interest may include host countries': wages, trade openness, real exchange rates, taxation, R&D expenditures, inflation, institutional setting, language etc and vary across studies depending on their focus.

5.3.2. Estimation technique: Poisson pseudo-maximum-likelihood (PPML)

For estimations of gravity model, an important fact about the bilateral FDI data requires careful consideration - FDI between pairs of countries can be zero. In many cases, these zeros occur simply because some pairs of countries do not have bilateral FDI in a given period. These zero observations pose no problem for the estimation of gravity equations in linear form. In contrast, the existence of observations for which the dependent variable is zero makes the estimation of gravity model in the log-linearized form infeasible (Silva and Tenreyro 2006). To deal with this issue researchers most often drop the pairs with zero FDI from the data set and estimate the log linear form by OLS, or occasionally use tobit estimators or specify the dependent variable as ln(1+FDI) instead of the natural logarithm of FDI. Those approaches however, may lead to estimation bias sinceit is possible that for pairs of countries that bilateral FDI did not reach certain minimum values the values of FDI between them are recorded as zero. Moreover zeros may sometimes represent missing observations that have falsely been recorded as zero. Given the standard approaches do not offer appropriate treatment of zero observation, this study applies the PPML technique introduced by Silva and Tenreyro (2006). The PPML technique doesn't require the dependent variables be expressed in log-linearised form and

is effective in mitigating the bias resulted from zero observations in the sample and robust to different forms of heteroscedasticity (Silva and Tenreyro 2006). The focus of this study is to develop a gravity model using the PPML estimation technique to identify the determinants of FDI and more specifically the effect of IP law protection and public IP enforcement in OECD countries (a complete list of countries covered can be found in Table 5.1 below). As such, it builds on the basic gravity equation (equation 3) and expands it to take into account some widely used economic factors as well institutional factors such as the IP law protection and public IP enforcement that affect bilateral FDI flows. To observe the effect in the long-run a set of panel data from 2001 to 2012 is used. The time period selected is based on data availability: Bilateral FDI flows data in OECD countries in earlier time periods is only available for a small number of countries and the IP enforcement measure is unavailable after 2012. The database for FDI flows in OECD countries is obtained from the United Nations conference on trade and development (UNCTAD).[27] A complete list of countries can be found in Table 5.1 below. Data for the variables of interest are all obtained from the World Bank's world development indicators dataset. Variables' definition and data sources can be found in Table 5.2. Denoting by i the home country and by j the host country, we develop the following augmented FDI gravity equation.

$$lnFDI_{ijt} = ln\beta_0 + \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 lnD_{ij} + \beta_4 lnGDP\ p.c_{it} + \beta_5 lnGDP\ p.c_{jt} + \beta_6 Trade_{jt} + \beta_7 RD_{jt} + \beta_8 IPSS_{jt} + \beta_9 Park_{jt} + \beta_{10} Lang_{ij} + lnu_{ij} \quad (4)$$

[27] The phenomenon is investigated in the OECD countries because data on the values of bilateral FDI flows/stocks are available only for selected countries and mostly for developed nations inside the EU and for OECD countries.

Where FDI_{ij} represents the flow of FDI from country i to host country j in year t, GDP_i , GDP_j the gross domestic product of country i and j in year t, D_{ij} the geographical distance in Km between country i's and country j's capitals, $GDP\ p.c_i$, $GDP\ p.c_j$ the labour quality of workers in home and host countries, $Trade_j$the trade openness of the host country as a percentage of GDP, RD_j the R&D expenditures of the host country as a percentage of GDP, $Lang_{ij}$ is the dummy capturing if a common language is used in home and host countries, $IPSS_j$ refers to the Papageorgiadis et al. (2014) International Patent System Strength (IPSS) index and is used to proxy the effect of IP enforcement, $Park_j$refers to the Park (2008) patent protection index and is used to proxy the effect of IP legislation and u_{ij} the error term.

Table 5.1 List of OECD countries included in this study

List of OECD countries		
Australia	Greece	New Zealand
Austria	Hungary	Norway
Belgium	Iceland	Poland
Canada	Ireland	Portugal
Chile	Israel	Slovak Republic
Czech republic	Italy	Spain
Denmark	Japan	Sweden
Finland	Korea	Switzerland
France	Mexico	Turkey
Germany	Netherlands	UK

Table 5.2 Definition of variables and sources of data

Variable	**Definition**	**Source**
Dependent variable		
FDI flows	Inward FDI flows (US million $)	United nations conference on trade and development

Independent variables		
Ln (GDP of home country)	Gross Domestic Product (current US $)	World development indicators
Ln (GDP of host country)	Gross Domestic Product (current US $)	World development indicators
Ln (GDP per capita of home country)	Gross Domestic Product per capita (current US $)	World development indicators
Ln (GDP per capita of host country)	Gross Domestic Product per capita (current US $)	World development indicators
Trade openness of host country	Trade openness of host country (% of GDP)	World development indicators
R&D expenditures of host country	R&D expenditures (% of GDP)	World development indicators
Human capital of host country	Labour force with tertiary education (% of total)	World development indicators
Common language	Dummy for countries sharing common language	Chelem
Ln (Distance)	Distance in Km between home and host countries - the flight distance between capitals	Chelem
Public IP enforcement of host country	International patent systems strength index (IPSS). Proxy for public IP enforcement	Papageorgiadis et al. (2014)
IP law protection of host country	International patent protection index. Proxy for IP law protection	Park (2008)

5.3.3. Dependent variable and variables of interest

The dependent variable employed in this study is the FDI flows. Flows are used rather than stocks as the later is more problematic because one is confronted with the question how to value assets of a multinational firm that were acquired in the past (Wacker 2013).[28] Inward FDI flow is explained according to the

[28]Simply speaking, FDI stocks are the (revalue) accumulation of past flows, while flows are the current transactions taking place in a certain period t, most importantly within a year. For a large

augmented gravity model (equation 4), using the basic explanatory variables included in the majority of studies such as GDP, GDP per capita and Distance (Bénassy-Quére et al. 2007; Busse et al. 2010; Faeth 2009; Kahouli and Maktouf 2015) as well as some economic and institutional variables.

The key economic variables used in the gravity model are the home's and host country's GDP a proxy for market size, host country's GDP per capital as a proxy for the labour costs, trade openness as a percentage of GDP, R&D expenditures as a percentage of GDP and the human capital. It is expected that home and host country's GDP to be positive as a larger market size attract more inward FDI. This study also controls for the host country's trade openness and expects that a host country open to trade will attract more FDI as found by Bajo-Rubio and Sosvilla-Rivero (1994) and Culem (1988). Lastly host country's R&D intensity is expected to attract more inward FDI as suggested by Barrell and Pain (1996) and Devereux and Griffith (1998).

To approximate for the institutional environment in the host country two indices are employed capturing the strength of IP law protection and the strength of public IP enforcement. The Park (2008) patent protection index measures the patent protection strength in 122 developed and developing countries from 1960 to 2005 and it ranges from 0 to 5, with higher values indicating stronger levels of patent protection (Ginarte and Park 1997). However although the Park (2008)

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number of economies, FDI stocks are estimated by either cumulating FDI flows over a period of time or adding flows to an FDI stock that has been obtained for a particular year from national official sources or the IMF data series on assets and liabilities of direct investment (UNCTAD 2018)

index quantifies the strength of patent law protection, it does not capture the patent enforcement strength (Fosfuri 2004; Javorcick 2004; Nichloson 2007; Nunnenkamp and Spatz 2004).

To approximate for the strength of the public IP enforcement the Papageorgiadis et al., (2014) International Patent Systems Strength (IPSS) index is employed. The IPSS index extends the Park (2008) index by capturing the degree to which the *de jure* laws are enforced in 48 developing and developed countries for the period 1998-2011. The IPSS index takes into account three types of transaction costs namely; i) servicing costs, iii) property rights protection costs and iii) monitoring costs and uses 10 secondary variables to measure them (Papageorgiadis et al. 2014). Compared with other available IP enforcement indices the IPSS index has the following advantages. First the composite IPSS index captures a number of different enforcement related aspects of patent systems. These different dimensions include; (1) the quality of patent administration, (2) judicial enforcement, (3) the level of corruption in judiciary, (4) the effectiveness of police enforcement, (5) the strength of border controls, (6) the perception of patent owners about national patent legislation and enforcement levels, (7) the cultural and societal attitudes towards the purchase of infringing goods and (8) the level of public commitment to patent legislation (Papageorgiadis et al. 2014). Other indices for instance the World Economic Forum (WEF) enforcement index captures the strength of IP law protection and the strength of one enforcement related aspect of IP systems in this case the managers perception towards IP law protection and enforcement in the countries they operate. As such the composite IPSS index allows approximating for more than one aspect of the enforcement dimension and

enables researchers to more holistically capture the strength of IP enforcement. Second, the IPSS index is developed by following a consistent methodology recommended by the Organization for Economic Co-operation and Development (OECD) in Constructing Composite Indicators. Third, it is fully transparent and quantitative in nature. Fourth it is built upon the transaction cost theory which is also one of the foundational theories that aid in the development of the theoretical arguments in this study. Thereof Park (2008) index is used as a proxy of the strength of IP law protection and IPSS index is used as a proxy of the strength of public IP enforcement.

5.4. Results and Discussion

The following tables present the descriptive statistics of all the variables included in the empirical estimation (Table 5.3), the correlation matrix of main variables (Table 5.4 and Appendix B), and the results for 5 models (Table 5.5). In Model 1 only the control variables excluding the variables of interest are included. In Model 2 all the variables except time dummies are included. The first two models' results are presented mainly to show consistency of the results. The discussion will be based on the results of Model 3 since it is the full model. In order to test the robustness of the results, the main sample is divided to capture the effect of the control variables and the variables of interest (i.e. public IP enforcement and IP law protection) before 2008. Models 4 and 5 include all the control variables and variables of interest but the latter also includes time dummy variables. The year 2008 was selected as the cut-off point for two reasons. First, as previously mentioned, due to the time limit (2006) given to implement the mandated TRIPS agreement changes, it is anticipated that IP law protection is likely to have had less of an effect after 2006. Second, the global economic crisis of 2008 affected many developed and developing economies and distorted the pattern of FDI flows between countries from this year onwards.

It can be seen in Table 5.5, the results across models are generally consistent with each other and most of the estimated coefficients have the expected signs and are statistically significant. In addition, the Model's explanatory power ($Pseudo\ R^2$) is respectable across these models. The results of Model 3 provide support to the central propositions of this study, that both the IP law protection and public IP enforcement element of IP systems have a positive effect on

bilateral FDI flows in OECD countries. Specifically in relation to Hypothesis 1, the coefficient of the IP law protection is positive though statistically insignificant (0.307) (Model 3) for the whole period (2001-2011). It is positive and statistically significant for the period before 2008 (0.467, $p<0.05$) in Model 5. The reason for the discrepancy between the two model results are due to the higher level of harmonisation of IP law protection in the sample countries after 2006 and the effect of the financial crisis. Before 2008, countries had not yet finalised changes to achieve the TRIPS level of IP law protection and therefore there was high variation across countries. After 2008, because of the higher level of harmonisation of IP law protection and the financial crisis, the effect of IP law protection became less significant though the effect is still positive.

In respect to Hypotheses 2 the coefficient of the public IP enforcement is positive and statistically significant (0.248, $p<0.01$), suggesting that stronger public IP enforcement leads to more bilateral FDI flows in OECD countries in the period 2001-2012. This result suggests that stronger public IP enforcement decreases MNEs' transaction costs, arising from the opportunistic nature of competitors to illegally acquire knowledge from the IP assets embedded in MNEs practices and products in the host country. Moreover, it increases the incentives for resource and strategic asset seeking FDI. Public IP enforcement is also positive and statistically significant (0.278, $p<0.01$) in Model 5 (pre-2008). This result implies that the strength of public IP enforcement is an important FDI determinant both before and after the initiation of the TRIPs agreement. This is so because although the TRIPs agreement sets the minimum standards on the level of IP law protection across countries, which are straightforward to assess if they have been integrated in the existing IP system,

the variation in public IP enforcement remains. In contrast with the strength of IP law protection that is now more consistent across WTO countries, the strength of public IP enforcement can vary according to the public IP enforcement agents' perceptions on what constitutes IP infringement and informal norms that are captured by the IPSS index. The fact that this study's results support Hypothesis 2 suggests it is imperative for future studies to conceptualise and test for the distinct effect of the strength of public IP enforcement on bilateral FDI flows and other IB related topics.

Table 5.3 Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
FDI flows	5,236	977.53	3,475.89	0.00	93,103.77
Ln (Distance)	7,404	7.84	1.16	4.09	9.87
Language	7,404	0.09	0.29	0.00	1.00
Ln (GDP for home country)	7,404	26.90	1.30	22.82	29.42
Ln (GDP per capita for home country)	7,404	10.35	0.97	7.03	23.58
Ln (GDP for host country)	7,404	26.92	1.21	22.82	29.42
Ln (GDP per capita for host country)	7,404	10.18	0.70	6.52	13.28
Trade Openness of host country	7,404	80.30	33.70	20.26	197.22
Tertiary education of host country	6,724	26.88	8.84	9.60	50.60
R&D expenditure of host country	6,767	1.82	1.00	0.31	4.48
Public IP enforcement of host country	7,241	7.25	1.77	3.70	9.80
IP law protection of host country	7,241	4.34	0.34	2.76	4.67

Table 5.5 The estimation results of the gravity equation

	Full Sample			Before 2008	
	FDI Flow (1)	**FDI Flow (2)**	**FDI Flow (3)**	**FDI Flow (4)**	**FDI Flow (5)**
Ln (Distance)	-0.705***	-0.691***	-0.656***	-0.708***	-0.674***
	[0.0425]	[0.0415]	[0.0422]	[0.0730]	[0.0828]
Language	0.409***	0.483***	0.515***	0.361**	0.427***
	[0.129]	[0.126]	[0.121]	[0.168]	[0.159]
Ln (GDP for home country	0.673***	0.681***	0.690***	0.613***	0.634***
	[0.0365]	[0.0368]	[0.0367]	[0.0485]	[0.0514]
Ln (GDP per capita for home country)	-0.0428	-0.0250	-0.0203	-0.0143	0.00608
	[0.0369]	[0.0367]	[0.0367]	[0.0591]	[0.0516]
Ln (GDP for host country)	0.549***	0.517***	0.556***	0.591***	0.601***
	[0.0402]	[0.0459]	[0.0468]	[0.0649]	[0.0600]
Ln (GDP per capita for host country)	0.131	-0.265*	-0.152	-0.876***	-0.708***
	[0.101]	[0.147]	[0.181]	[0.219]	[0.260]
Trade Openness of host country	0.00346**	0.00221	0.00335*	0.00270	0.00271
	[0.00145]	[0.00158]	[0.00184]	[0.00235]	[0.00315]
Tertiary education of host country	0.0440***	0.0352***	0.0251***	0.0378***	0.0252***
	[0.00540]	[0.00591]	[0.00597]	[0.00890]	[0.00792]
R&D expenditure of host country	-0.177***	-0.311***	-0.342***	-0.122	-0.102
	[0.0584]	[0.0734]	[0.0703]	[0.0999]	[0.0948]
Public IP enforcement of		0.224***	0.248***	0.293***	0.278***

host country					
		[0.0548]	[0.0624]	[0.0648]	[0.0889]
IP law protection of host country		0.449*	0.307	0.551*	0.467**
		[0.245]	[0.242]	[0.285]	[0.233]
Intercept	-23.51*** [1.708]	-22.15*** [1.712]	-24.52*** [2.070]	-17.53*** [1.895]	-19.54*** [3.050]
Time dummies	Not included	Not included	Included	Not Included	Included
N	4424	4321	4321	2449	2449
Pseudo R^2	0.4735	0.4845	0.5162	0.4554	0.4753

Standard errors in brackets * $p< 0.10$, ** $p< 0.05$, *** $p< 0.01$

With regards to the estimates of the control variables, the positive and significant coefficients for common language, home and host country GDP, and the negative and significant coefficient for distance indicate that FDI is determined by gravity factors (Bevan and Estrin 2004). These results are consistent with those of previous studies (Kahouli and Maktouf 2015; Hejazi 2009; Bénassy-Quére et al. 2007; Bevan and Estrin 2004),which argue that the common language between home and host country positively affects FDI, larger market sizes attract more FDI, but the gains from overseas production may diminish with increasing distance between the home and host country. The GDP per capita is a proxy for the host country's labour costs and the negative coefficient implies the countries with lower labour costs are more likely to attract a higher level of FDI, particularly FDI in labour-intensive sectors(Bevan and Estrin 2004; Kahouli and Maktouf 2015). The estimated coefficient of the trade openness is positive and statistically significant across all tested models, supporting the view that FDI and trade are complementary to each other rather than substitutive(Bevan and Estrin 2004; Chakrabarti 2001; Kahouli and

Maktouf 2015). This is so because the majority of investment projects are directed towards the tradable sectors and thus the host country's degree of trade openness could be an important determining factor of FDI (Chakrabarti 2001).Human capital (proxied by a host country's level of tertiary education) is positive and statistically significant in all models. This result suggests that MNEs will assess a host country's educational level and select countries where potential employees have the skills and capabilities to utilise MNEs' advanced technological and managerial know-how (Kahouli and Maktouf 2015; Hejazi 2009). Lastly, the estimated coefficients of the R&D expenditures are negative and significant in Model 3. The negative coefficient may be caused by the fact that the R&D expenditure variable only includes government's R&D expenditure. A better approach would be to use the overall R&D expenditures by both government and private firms, but this cannot be achieved because of data availability issue.

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5.5. Conclusions

This study addresses **RQ3** by applying a gravity model using the PPML technique to investigate the impact of public IP enforcement on bilateral FDI flows in OECD countries. By investigating the distinct effect of public IP enforcement and by employing the IPSS index, this study addresses the identified research gap (see introduction section) by producing up-to-date evidence for two time periods 2001-2011 and 2001- 2008. The results of this study in particular, emphasise the importance of public IP enforcement as a key FDI determinant that could potentially boost recipient countries' location advantage and thus increase FDI flows. Since the level of IP law protection has been harmonised across the WTO countries, strong IP law protection is now taken for granted when investing to or from WTO countries and no longer adds to a country's location advantage. On the contrary because public IP enforcement is undertaken by enforcement agents (such as police, lawyers, judges) whose own cultural influences, informal beliefs and past experiences can influence the effectiveness of IP enforcement (North 1990), enforcement levels still vary between WTO countries (WTO 2017). The results of this study pinpoint to a positive and significant relationship between the strength of public IP enforcement and bilateral FDI flows in OECD countries. This result is consistent with a transaction costs analysis of FDI, in which strong public IP enforcement minimises foreign investors' transaction costs by decreasing the opportunistic behaviour of competitors to illegally acquire knowledge on the assets under transactions. Moreover it allows MNEs to uphold and pursue their rights in case of violation. From the Eclectic paradigm analysis of FDI, host countries with strong public IP enforcement offer an ownership and location

advantage and attract higher levels of FDI. Since FDI plays an important role in countries' economic prosperity (Kahouli and Maktouf 2015), identifying its key determinants can allow recipient countries to adjust their programs to attract more FDI. The findings of this study offer some insights to policymakers on how to make their country more attractive for investment. Evidence from previous studies (pre-2000) and the results of this study suggest that countries that offer strong public IP enforcement are positively perceived by MNEs and have benefitted from increased FDI flows.

APPENDIX B

Table 5.4 Correlation matrix

	1	2	3	4	5	6	7	8	9	10
1										
2	0.03									
3	0.07	0.08								
4	0.01	0.09	0.27							
5	0.17	0.06	0.07	0.07						
6	-0.02	0.06	0.09	0.09	0.36					
7	-0.34	0.01	0.01	0.06	-0.51	-0.02				
8	0.26	0.19	0.05	0.07	0.23	0.43	-0.13			
9	0.07	0.07	-0.01	-0.01	0.16	0.60	-0.07	0.50		
10	0.02	0.09	0.00	-0.02	0.16	0.79	-0.01	0.52	0.69	
11	-0.04	0.05	0.05	0.07	0.54	0.58	0.00	0.30	0.39	0.49

Where:

1 refers to Ln (Distance)

2 refers to Language

3 refers to Ln (GDP for home country)

4 refers to Ln (GDP per capita for home country)

5 refers to Ln (GDP for host country)

6 refers to Ln (GDP per capita for host country)

7 refers to Trade Openness of host country

8 refers to Tertiary education of host country

9 refers to R&D expenditure of host country

10 refers to Public IP enforcement of host country

11 refers to IP law protection of host country

CHAPTER 6

OVERALL CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

This final chapter summarises the main empirical findings of this study, the key contributions made to the academic literature, and the potential limitations and future research directions.

This thesis conceptualises the effect of IP law protection and public IP enforcement through the lens of institutional and transaction cost theory. Specifically, it examines the effect of IP systems on the productivity of domestic firms influenced by the presence of foreign MNEs in the country and on bilateral FDI flows. It addresses three research questions namely: **RQ1**-What are the effects of the IP law protection and public IP enforcement on FDI horizontal spillovers?; **RQ2**-What are the effects of the IP law protection and public IP enforcement on FDI vertical spillovers?; **RQ3**-What are the effects of the IP law protection and public IP enforcement on bilateral FDI flows in OECD countries? By addressing the aforementioned **RQs** this thesis, fills the gap in the existing literature and makes the following contribution to the literature on the IP systems, FDI spillovers and FDI determinants. This thesis extends and updates the existing theoretical model on IP systems by conceptualising the distinct effect of public IP enforcement on FDI flows and FDI spillovers that has been neglected in the literature. Although the literature suggests that 'the real issue is whether a country adequately enforces the laws and regulations it has in place' (Maskus 2004:22), existing studies on FDI spillovers and FDI flows have only considered the direct effect of the strength of IP law protection (Havranek and Irsova 2011; Smeets and de Vaal 2016). To address this dearth in the literature,

this study posits that the strength of an IP system is subject both to the availability of IP law protection and the effective enforcement of the legal framework.

6.1. Conclusions on FDI spillovers

In Chapters 3 and 4 respectively, this thesis revisited the highly researched topic of MNE productivity effects on domestic firms using a meta-analytic approach. The main contribution is that for the first time, the direct effect of the strength of pubic IP enforcement on FDI spillovers and the moderating effect on the relationship between the IP law protection and FDI spillovers are investigated. While it is acknowledged that prior research used quantitative approaches and considered the effect of formal institutions on FDI spillovers, the informal institutions and the interplay between the two were ignored. Previous research identified that one pillar of an IP system i.e. IP law protection, influences FDI spillovers in a positive and a negative way (Irsova and Havranek 2013, 2011; Smeets and deVaal 2016; Yi et al. 2015). This thesis provides an example of how institutional theory as a whole can be applied in the investigation of FDI spillovers. Specifically it extends the FDI spillovers literature by explaining how the second neglected pillar of an IP system i.e. public IP enforcement, also influences the spillover effects of FDI.

Building on institutional and transaction costs theory (North 1990; Williamson 1981), this thesis developed a conceptual framework that demonstrates how IP law protection and public IP enforcement play an important role in the generation of FDI spillovers. It argued that stronger public IP enforcement as an institutional mechanism, minimises MNEs' transaction costs by limiting domestic

firms' opportunistic behaviour to illegally access MNEs' ownership advantage in the form of IP. As a result public IP enforcement positively influences MNEs' willingness to transfer and develop technology in the host country, domestic firms' absorptive capacity and the ways the two types of firms interact (whether JV or other contractual agreements). While such a positive effect exists, Chapters 3 and 4 also revealed a negative relationship when a given country offers strong IP law protection and public IP enforcement. This result highlights how, in countries where MNEs are able to receive strong legal protection for their IP assets and can effectively enforce their IP in case of infringement, MNEs are expected to gain strong market power in their respective industries and stifle the productivity of domestic firms. By bringing an institutional context to the foreground and introducing IP systems as a core component of the FDI spillovers generation process, this thesis extends the literature on FDI spillovers that has previously relied on the absorptive capacity and endogenous growth theory to explain how domestic firms benefit from the foreign presence by identifying two new institutional mechanisms that were previously unknown in the literature.

Methodologically, in chapters 3 and 4, a meta-analysis of the literature consisting of 49 published and unpublished FDI horizontal spillover papers and 27 published and unpublished FDI vertical spillover papers for the period 1998-2011 was conducted. The ordered probit model estimation technique and a categorical dependent variable capturing the existence and direction of FDI spillovers were employed. By using this approach, this study was able to overcome the methodological limitations of previous meta-analytic studies of FDI spillovers (Meyer and Sinani 2009; Gorg and Strobl 2001; Irsova and

Havranek 2013; Havranek and Irsova 2011) that the comparability of the t-statistics or semi-elasticities across studies is economically and statistically problematic. In addition, the FDI horizontal and vertical spillovers studies improve upon empirical studies that use a measurement of IP systems that lacks a component that addresses the actual enforcement of law. Here, a newly developed international patent systems strength index (IPSS) by Papageorgiadis et al. (2014) is usedin order to capture the actual enforcement of law.

6.2. Conclusion on bilateral FDI flows

Chapter 5 of this thesis examined the much researched topic of the factors affecting MNEs' FDI flows. Following the same conceptualisation on the distinct role of the public IP enforcement element of an IP system, Chapter 5 extends the literature on FDI determinants by conceptually investigating and empirically testing for the distinct effect of public IP enforcement on bilateral FDI flows in OECD countries. The main contribution of this study is that it moves away from the existing research conclusions that hold IP law protection as a key FDI determinant, and suggests that in the post-TRIPs agreement era the effectiveness of public IP enforcement alone will influence the levels of bilateral FDI. Prior research conducted in the pre-TRIPs agreement or implementation period era, identifies IP law protection as a key FDI determinant for IP dependent MNEs since the laws on granting and registering of IP differed greatly between countries. In the post-TRIPs agreement era, IP law protection was completely harmonised among the WTO countries (Peng et al. 2017) but differences remained in the level of public IP enforcement, because the TRIPs

agreement had not set any obligations regarding how IP laws should be applied in case of violations (Papageorgiadis and McDonald,2018).

Building on the Eclectic paradigm (Dunning 1993), this thesis argues that the levels of public IP enforcement in a given country will act as a location advantage for IP dependent MNEs attracting (or not) inward FDI. Indeed the results suggest that the strength of IP law protection in a country has an insignificant effect on bilateral FDI flows in OECD countries while the strength of public IP enforcement in a country has a positive effect on bilateral FDI flows in OECD countries. Therefore these findings update the literature on FDI determinants by introducing a new FDI determinant that of the public IP enforcement.

Methodologically this study is based on a panel data set covering 30 OECD countries over the period 2001-2012 employing the gravity model and the Poisson Pseudo-Maximum Likelihood (PPML) estimation technique. The PPML technique in comparison with other estimation techniques employed in the literature, allows for the inclusion of ‘zero’ values for the dependent variable and at the same time mitigates the estimation bias associated with the inclusion of observations with a value of zero for the dependent variable.

6.3. Overall policy and managerial implications

The first important finding of this thesis is that in the post-TRIPs agreement era, stronger public IP enforcement becomes a location advantage to the host countries increasing bilateral FDI flows in OECD countries. The fact that the effect of strong IP law protection on bilateral FDI flows in OECD countries are found to be insignificant, may point towards the replacement of the IP law

protection as a key FDI determinant by the public IP enforcement in the post-TRIPs agreement era. Since FDI plays an important role in countries' economic prosperity (Kahouli and Maktouf 2015), identifying its key determinants can allow recipient countries to adjust their regulations to attract more FDI. The belief that FDI improves countries' economic prosperity has led local governments to use incentive packages, such as tax breaks, to attract foreign investments (Yi et al. 2015). Based on the findings of this study, another policy option for countries wishing to attract technological intensive FDI would be for local governments to improve their institutions by strengthening the enforcement of IP laws. Countries ensuring that MNEs' rights will be upheld in case of violation will stand to benefit from increased capital inflow as well as positive externalities, such as FDI spillovers. MNEs managers could also find value in this study's findings. Strong IP law protection and public IP enforcement can inform MNEs' decisions on where to locate. MNEs basing their success on intangible assets such as patents, will select locations that allow them to best exploit their ownership advantage. Strong public IP enforcement reinforces MNEs' ownership advantage (if in the form of IP) as it ensures that their rights will not only be granted but also upheld in case of violation.

The findings of this thesis on FDI spillovers, suggest that stronger public IP enforcement has a direct positive effect on FDI spillovers. Furthermore, these studies find that the levels of public IP enforcement negatively moderate the effects of IP law protection on FDI spillovers. This result showcases how MNEs can gain strong market power in their respective industries and stifle the productivity of domestic firms in countries where they are able to receive strong legal protection for their IP assets and can effectively enforce their IP in case of

infringement. In such cases, policymakers need to monitor closely the strengthening of public IP enforcement in their respective country and seek to identify and potentially intervene, in a timely manner, in order to avoid or overcome instances when the productivity spillovers start becoming negative. Several solutions to address the adverse effect of strong IP law and enforcement on domestic firms' productivity are put forward in this thesis. First, policymakers may need to initiate a dialogue with countries facing such an issue as to how and if IP law protection could be relaxed. A possible solution from which both IP owners and domestic firms could benefit, is a reduction in the patent protection period. Policymakers could identify an optimal threshold at which IP owners can still reap the benefits of their investments, while domestic firms can access relatively new technologies, absorb them and incorporate them into their own practices in order to remain competitive against the foreign firms. Having said that it must be mentioned, that although IP law protection could potentially be relaxed, it is advisable that public IP enforcement remains strong. Although changing the formal institutions i.e. IP law protection maybe relatively straightforward, local governments may encounter issues when pushing for stronger IP enforcement. As has already been argued in this thesis, public IP enforcement is influenced by a country's informal institutions, and as informal institutions are more difficult to change a change in norms regarding IP violations in a society may occur far more gradually (North 1992). Nevertheless local governments should insist on developing stronger public IP enforcement as it will ensure IP owners of both foreign and domestic firms, that their rights will be granted and upheld in case of violation. This will lead to increased flows of technologically intensive FDI, from which both economic and spillover

benefits can be gained, and the development of advanced technology inside the host country by the foreign and/or domestic firms. Second, to minimise the monopolistic power of MNEs and the adverse effect of competition on domestic firms, policymakers can initiate some changes in the following: i) market structure, ii) pricing regulations such as clawback policy and iii) competition policies. Regarding the market structure, governments could control for the number of firms competing in IP dependent industries by lowering the barriers to entry. In this way more firms could enter the industry and offer alternative options confining the monopolistic power of MNEs. Moreover countries' openness to trade provide the opportunity for domestic firms to import their necessary goods from other countries at lower prices, not having necessarily to buy them from the MNEs in the host country. In respect to the pricing regulations, governments may moderate tendencies towards monopoly pricing (charging premium prices). A suggestion could be the clawback policy implemented by the Greek government in 2012 to address the high spending in the Healthcare sector.[29] Briefly the clawback calculation is based on the market share of the pharmaceutical companies in the Greek pharmaceutical industry and means that if a pharmaceutical company's sales grow in line with medical demand, then its bill to the state increases. A clawback policy could compel IP holders to decrease their prices in order to avoid exceeding the governments' predetermined refund limit. Lastly, governments could accompany the strengthening of public IP enforcement with appropriate competition policies (Maskus 2000; Smeets and de Vaal 2016) such as the enforcement of the

[29]In 2012, a mechanism referred to as *clawback*, for the automatic refund of amounts that exceeded the state's public pharmaceutical expenditure budget was instituted in law (Souliotis et al., 2015). Following a ministerial decree the ceiling for pubic pharmaceutical expenditure was specified at 1% of the country's GDP, which was applicable as of 2014 (Souliotis et al., 2015).

Competition Act (1998). The Competition Act (1998) prohibits anti-competitive agreements between businesses (such as formation of cartels), making it illegal for a business to abuse a dominant market position (Office of Fair Trading 2007).[30] One type of practice that could indicate abuse is the charging of unfair prices, or price fixing or agreements to limit supply (Office of Fair Trading 2007). Thus for domestic firms to potentially experience positive FDI spillover benefits, governments and relevant public enforcement agents should be prepared and eager to detect violations of the Competition Act (1998) and award appropriate penalties to their offenders. The effective implementation of the aforementioned suggestions could confine the monopolist power of MNEs, resulting from the strengthening of public IP enforcement.

From the MNEs' perspective, stronger IP law protection and public IP enforcement allow for the successful exploitation of their ownership advantage while blocking the spillovers channels responsible for the diffusion of their knowledge to domestic firms. Such countries create incentives for MNEs to invest and to engage in collaborative agreements (like JV) with the domestic firms. Domestic firms are advised to explore the opportunity to collaborate with the foreign firms and get exposed to new technologies via the legal exchange and transfer of knowledge inside the contractual agreement. Moreover stronger IP systems can give incentives to domestic firms to stop basing their productivity on the infringement of goods and invest in the development of their own capabilities and come with their own innovative products (North 1992). In

[30] This mainly applies to businesses that have a large market share, usually but not limited to 40 per cent or more (Office of Fair Trading, 2007). Other factors taken into consideration in determining whether a company is dominant include, the number and size of competitors and customers and whether new businesses can be easily set up in competition (Office of Fair Trading, 2007). The type of practices that could indicate abuse include charging unfair prices or imposing other unfair trading conditions on customers, limiting production, or refusing to supply an existing customer without an objective reason (Office of Fair Trading, 2007).

addition, domestic firms can get exposed to MNEs' knowledge via patent disclosures or by the mere presence of their products in the market, get inspired and engage in innovative activities that will allow them to improve and develop their capabilities and outputs further. As such they may become competitive and successfully compete with the MNEs.

6.4. FDI spillovers: limitations and future research

While the two sets of results from the FDI spillovers studies advance the existing literature on the impact of IP systems on FDI spillovers, they have some limitations. First, since a meta-analysis is based on the collection and use of published secondary data, the initial methodological procedures followed by the primary researchers for the collection of their data are not known to the current researcher, thus errors or biased opinions may be included in the original sample (Saunders et al. 2003; Eapen 2013; Meyer and Sinani 2009). To control for such issues a meta-analytic protocol suggested by Stanley and Doucouliagios (2012) was followed. Second, since the meta-analysis requires the aggregation of information from existing studies, the types of information provided by the primary studies may vary. For instance, there might be certain information omitted in the meta-analysis, due to either missing information or inconsistent or incompatible data reported in primary studies. Third, the number of primary studies included in these meta-analyses is constrained by the coverage of the IP enforcement index used by them. To address these three limitations, future research needs to validate the models used in this study by extending the coverage with the use of an updated IP enforcement index and primary studies which have not been included in the meta-analyses of this thesis. Moreover to overcome the limitation of using a meta-analytic

methodology but still aim for generalisability of research findings, future FDI spillovers studies can use a large firm-level dataset, as in Smeets and de Vaal (2016).

Fourth, this study does not control for the effect of MNEs heterogeneity on FDI spillovers, because of the insufficient number of papers available looking at the effect of MNEs ownership and establishment type on FDI spillovers. Future research following an alternative methodology to meta-analysis, can build on this existing study and try to unpack the moderating impact of public IP enforcement on the relationship between MNEs characteristics (such as ownership and establishment type) and FDI spillovers. Future research can also consider public IP enforcement as a determinant for the selection of the foreign affiliates' ownership and establishment type, building and extending the existing literature on the factors affecting spillover benefits (Dimeli and Louri 2002; Puck et al. 2009),

Fifth, this study does not control for the effect of spillover channels on the generation of FDI spillovers, because research on this topic is scarce and there was an insufficient number of published studies to be included in the meta-analysis. Existing research has produced some limited evidence on the effect of export, competition and wage spillover channels (Gorg and Greenaway 2003) on FDI spillovers, but has not yet investigated in-depth the effect of demonstration and labour turnover channels. Future work could enrich this research area by not only controlling for the effect of spillover channels but also by considering the moderating role of public IP enforcement on the relationship between spillover channels and FDI spillovers.

The last limitation relates to the use of the IPSS index to capture the effect of the main variable of interest (i.e. public IP enforcement) in the FDI spillover and bilateral FDI flows studies of this thesis. This thesis takes a realism approach using a quantitative methodology to capture the effect of public IP enforcement on FDI spillovers, as such a quantitative measure for IP enforcement was necessary. Although the IPSS index is a composite index attempting to capture as many different dimensions of patent enforcement as possible (it captures eight)it suffers from the following limitation. First, the responders 'perception' is at the heart of the index. Perceptions about a matter are formed through experience, cultural inheritance, and/or personal attributes. Different responders with different experiences, culture and personal attributes may have a different opinion on what constitutes IPR violation, the consumption of infringed goods, whether the judiciary is corrupt, and whether the police and border control do their job properly (all the aforementioned are elements of the IPSS index). For instance in a country where IPR are not respected and scores low at the IPSS index, there is a possibility that the responders are actually the ones that engage in infringing activities without compunction making their perceptions towards IP infringement biased. Along the same lines, a responder with high moral standards may consider the consumption of infringed goods inappropriate. Moreover, responders living only in one country are unable to compare and objectively assess the enforcement levels of their home country. In addition, perceptions of participants may not be reflective of their true opinion and may have been influenced by country specific phenomena at the time the data were collected. For instance at the peak of the economic crisis in 2012 Greece scored 36 out of 100 in the Corruption Perception Index, whereas in

2017, this same index scored 48. Furthermore, since corrupt practices are by default illegal, they are shrouded in secrecy; making it difficult for one to accurately measure the level of corruption in the judiciary per se (another element of the IPSS index). Lastly, the most challenging aspect of such perception related indices is to quantify the results gathered using the participants' perceptions. The coding and transformation of such data may limit the explanatory power of the original data.

To address the aforementioned limitations, this study's results could benefit from a mixed method approach and the use of a qualitative methodology such as semi-structured interviews. Since one aspect of the public IP enforcement relates to the public enforcement agents' ideologies and informal norms on what constitutes IPR violations, in-depth interviews could reveal information that cannot be captured with the use of Likert scale questionnaires often used in the collection of data for constructing indices. A research design where data for the dependant variable (domestic firms' productivity) and the main independent variable (public IP enforcement) are collected via interviews could enrich this study's findings providing insights into questions such as: why are laws not enforced in certain countries like China (Peng et al 2017)?; how do MNEs react in such cases?; how do domestic firms in countries with strong public IP enforcement cope with the aggressive competition? Although a qualitative methodology is not the mainstream approach in FDI spillovers research nor indeed the IB discipline generally, some studies do exist (Gerschenberg 1987; McKendrick et al. 2000; Lecraw 1977).

6.5. Bilateral FDI flows limitations and future research

The limitations of this chapter mainly relate to the selection of the dependent, independent and control variables. Apart from the variables of interest, namely the IP law protection (proxied by the Park (2008) patent protection index) and the public IP enforcement (proxied by the IPSS index), independent variables were selected based on their recurrent appearance in the reviewed literature. Following the review papers of Faeth (2009), Blonigen (2005), and Chakrabari (2001) the most commonly used FDI determinants of market size, language, distance, GDP per capita, human capital and R&D expenditures, are included in the model. Because the main focus of this study is on the IP systems, the inclusion of other independent variables e.g. bilateral trade agreement, was beyond its scope. However, the addition of different variables could potentially alter the final findings and future research could experiment with additional or different variables and compare the findings with the established FDI determinants.

Moreover since this study suggests that IP law protection as a determinant is replaced by public IP enforcement in the post-TRIPs agreement era, future research could provide more support and additional robustness by employing different IP enforcement measurements to investigate the phenomenon further. Regarding the dependent variable used in this study, the literature usually selects between the FDI stocks and FDI flows obtaining their data from quantitative databases such as the UNCTAD. A final recommendation for future work is that an alternative approach could use firm level survey data to investigate the effect of public IP enforcement on MNEs location choices.

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